

# Appendix E

## Geosynthetics Laboratory Test Results

# Appendix E1 Geotextiles

# Appendix E1.1 Type A Geotextile

**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95379A

**IDENTIFICATION:** Geotextile Type A: A-1 Roll 030593660, A-2 Roll 030593648, A-3 Roll 030593665, A-4 Roll 030593654  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Mass per Unit Area of Geotextiles ASTM D5261 - 10

**TEST CONDITIONS:** Conditioned sample(s) (21°C, 65% R.H.);  
 10 test specimens of circular shape per product ;  
 Surface used (cm<sup>2</sup>): 100  
 Tested March 30, 2017

**RESULTS:**

	Individual Data					Avg.	S.D.	% CV
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**A-1 Roll 030593660**

Mass per unit area (g/m <sup>2</sup> ):	371	416	411	375	390	<b>375</b>	25	<b>6.7</b>
	381	355	339	350	365			

Mass per unit area (oz./yd. <sup>2</sup> ):	16.0	16.4	15.8	17.2	17.0	<b>17.4</b>	1.3	<b>7.2</b>
	16.9	19.7	18.8	18.4	17.6			

**A-2 Roll 030593648**

Mass per unit area (g/m <sup>2</sup> ):	374	356	353	365	418	<b>361</b>	23	<b>6.5</b>
	329	356	367	345	351			

Mass per unit area (oz./yd. <sup>2</sup> ):	16.9	16.7	17.4	16.9	17.7	<b>17.3</b>	0.4	<b>2.2</b>
	17.4	17.1	17.6	17.9	17.2			

**A-3 Roll 030593665**

Mass per unit area (g/m <sup>2</sup> ):	355	359	363	367	329	<b>359</b>	16	<b>4.6</b>
	390	352	345	356	374			

Mass per unit area (oz./yd. <sup>2</sup> ):	15.9	16.6	16.6	16.0	16.5	<b>16.3</b>	0.3	<b>1.7</b>
	16.1	16.1	16.6	16.3	16.5			

Prepared by:

*Nancy Desautels*  
 Nancy Desautels,  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

**\*\*For any information concerning this report, please contact Eric Blond\*\***

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**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
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 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Mass per Unit Area of Geotextiles ASTM D5261 - 10

RESULTS (CONT):	Individual Data					Avg.	S.D.	% CV
<b>A-4 Roll 030593654</b>								
Mass per unit area (g/m <sup>2</sup> ):	336	359	358	348	350	<b>346</b>	16	<b>4.6</b>
	316	324	363	345	360			
Mass per unit area (oz./yd. <sup>2</sup> ):	16.9	16.4	16.1	16.3	16.8	<b>17.0</b>	0.6	<b>3.7</b>
	17.5	16.9	18.0	17.5	17.6			

Prepared by: *Nancy Désautels*  
 Nancy Désautels,  
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Approved by: Sylvie Dalpé *Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President Date: May 25, 2017

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 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Measuring the Nominal Thickness of Geosynthetics ASTM D5199-12

**TEST CONDITIONS:** Conditioned sample(s) (21 °C, 65 % R.H.);  
 Dimension of the test specimens: minimum diameter of 75 mm;  
 Apparatus: Frazier - measuring unit: inch (has precedence on the values in mm) ;  
 Procedure used: A  
 Diameter of the presser foot (mm): 57  
 Pressure applied (kPa): 2  
 Loading time interval: 5 sec. ;  
 Tested March 30, 2017

**RESULTS:** Individual Data Avg. S.D. % CV

**A-1 Roll 030593660**

Thickness (mils):	139	143	140	133	137	135	4	3.3
	136	133	130	131	131			

Thickness (mm):	3.53	3.63	3.56	3.38	3.48	3.44	0.11	3.2
	3.45	3.38	3.30	3.33	3.33			

**A-2 Roll 030593648**

Thickness (mils):	130	133	130	128	143	129	6	4.5
	122	123	129	128	127			

Thickness (mm):	3.30	3.38	3.30	3.25	3.63	3.28	0.15	4.5
	3.10	3.12	3.28	3.25	3.23			

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 Nancy Désautels,  
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 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Measuring the Nominal Thickness of Geosynthetics ASTM D5199-12

**RESULTS (CONT):** Individual Data Avg. S.D. % CV

**A-3 Roll 030593665**

Thickness (mils):	134	132	130	127	129	<b>131</b>	3	<b>2.5</b>
	136	134	129	127	135			

Thickness (mm):	3.40	3.35	3.30	3.23	3.28	<b>3.34</b>	0.08	<b>2.5</b>
	3.45	3.40	3.28	3.23	3.43			

**A-4 Roll 030593654**

Thickness (mils):	130	133	137	138	129	<b>130</b>	5	<b>3.9</b>
	121	127	127	128	131			

Thickness (mm):	3.30	3.38	3.48	3.51	3.28	<b>3.31</b>	0.13	<b>3.9</b>
	3.07	3.23	3.23	3.25	3.33			

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 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Grab Breaking Load and Elongation of Geotextiles ASTM D4632/D4632M-15a

**TEST CONDITIONS:** Apparatus used: Dynamometer with a Constant Rate of Extension (CRE);  
 Grip surface texture: rubber;  
 Speed: 300 mm/min;  
 Full scale range used: 5kN  
 10 test specimens per direction ;  
 Conditioned sample(s) (21°C, 65 % R.H.) ;  
 Tested March 30, 2017

**RESULTS:** Individual Data Avg. S.D. % CV

**A-1 Roll 030593660**

**MACHINE DIRECTION** ...

	1240.6	1314.6	942.7	1180.8	1099.3	1 304.3	198.8	15.2
Grab Breaking Load (N):	1265.8	1456.7	1579.8	1486.7	1476.2			
Grab Breaking Load (lb):	278.9	295.5	211.9	265.5	247.1	293.2	44.7	15.2
	284.6	327.5	355.1	334.2	331.9			
Elongation at break (%):	60.8	66.4	77.4	68.4	66.2	66.6	6.6	10.0
	76.2	69.9	63.4	56.6	61.1			

**CROSS DIRECTION** ...

	1269.2	1224.0	1196.8	1416.2	1384.1	1 322.0	93.7	7.1
Grab Breaking Load (N) :	1242.1	1481.6	1275.5	1348.8	1381.6			
Grab Breaking Load (lb) :	285.3	275.2	269.0	318.4	311.1	297.2	21.1	7.1
	279.2	333.1	286.7	303.2	310.6			
Elongation at break (%) :	80.5	79.7	76.4	78.0	74.1	79.7	5.9	7.4
	69.6	87.8	89.4	81.6	80.0			

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 Catherine Groleau Rivard, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

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 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Grab Breaking Load and Elongation of Geotextiles ASTM D4632/D4632M-15a

**RESULTS (CONT):** Individual Data Avg. S.D. % CV

**A-2 Roll 030593648**

**MACHINE DIRECTION**

	1409.7	1130.5	1122.4	1183.2	1247.5	<b>1 289.0</b>	111.8	<b>8.7</b>
Grab Breaking Load (N):	1345.7	1311.9	1415.2	1332.0	1391.6			
Grab Breaking Load (lb):	316.9	254.1	252.3	266.0	280.4	<b>289.7</b>	25.1	<b>8.7</b>
	302.5	294.9	318.1	299.4	312.8			
Elongation at break (%):	63.7	66.0	66.4	73.0	70.9	<b>64.8</b>	5.6	<b>8.7</b>
	67.2	66.4	60.7	53.3	60.7			

**CROSS DIRECTION**

Grab Breaking Load (N) :	1340.4	1504.4	1424.6	1307.0	1444.2	<b>1 409.1</b>	66.7	<b>4.7</b>
	1441.9	1483.3	1328.1	1384.1	1432.9			
Grab Breaking Load (lb) :	301.3	338.2	320.3	293.8	324.7	<b>316.8</b>	15.0	<b>4.7</b>
	324.1	333.4	298.6	311.1	322.1			
Elongation at break (%) :	70.7	72.4	67.1	63.3	70.9	<b>73.8</b>	6.6	<b>9.0</b>
	71.3	77.5	84.0	82.3	78.5			

Prepared by:

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 Catherine Groleau Rivard, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
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 Vice-President

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 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Grab Breaking Load and Elongation of Geotextiles ASTM D4632/D4632M-15a

**RESULTS (CONT):** Individual Data Avg. S.D. % CV

**A-3 Roll 030593665**

**MACHINE DIRECTION** ...

Grab Breaking Load (N):	1464.1	1392.1	1240.6	1202.9	1074.6	<b>1 244.5</b>	128.3	<b>10.3</b>
	1124.1	1176.8	1153.5	1230.7	1385.8			
Grab Breaking Load (lb):	329.1	312.9	278.9	270.4	241.6	<b>279.8</b>	28.8	<b>10.3</b>
	252.7	264.6	259.3	276.7	311.5			
Elongation at break (%):	61.2	61.8	62.6	65.3	59.6	<b>62.2</b>	3.8	<b>6.1</b>
	66.9	68.9	60.0	59.3	56.5			

**CROSS DIRECTION** ...

Grab Breaking Load (N) :	1493.6	1345.1	1616.9	1253.9	1113.1	<b>1 360.8</b>	148.8	<b>10.9</b>
	1449.2	1374.7	1278.1	1224.3	1458.7			
Grab Breaking Load (lb) :	335.8	302.4	363.5	281.9	250.2	<b>305.9</b>	33.5	<b>10.9</b>
	325.8	309.0	287.3	275.2	327.9			
Elongation at break (%) :	73.4	65.9	71.4	68.4	61.2	<b>71.8</b>	7.4	<b>10.3</b>
	66.4	68.8	75.3	85.7	81.1			

Prepared by:

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 Catherine Groleau Rivard, Tech.  
 Technician

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 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Grab Breaking Load and Elongation of Geotextiles ASTM D4632/D4632M-15a

**RESULTS (CONT):** Individual Data Avg. S.D. % CV

**A-4 Roll 030593654**

**MACHINE DIRECTION**

	Individual Data					Avg.	S.D.	% CV
Grab Breaking Load (N):	1286.4	1436.2	1327.8	1333.2	1204.9	<b>1 274.8</b>	77.7	<b>6.1</b>
	1236.9	1164.9	1240.2	1288.2	1228.8			
Grab Breaking Load (lb):	289.2	322.9	298.5	299.7	270.9	<b>286.6</b>	17.5	<b>6.1</b>
	278.0	261.9	278.8	289.6	276.2			
Elongation at break (%):	63.7	68.8	67.8	72.4	65.8	<b>69.7</b>	3.6	<b>5.2</b>
	71.3	71.7	67.6	75.8	72.0			

**CROSS DIRECTION**

Grab Breaking Load (N) :	1487.3	1516.9	1572.9	1288.8	1187.6	<b>1 372.4</b>	122.7	<b>8.9</b>
	1400.3	1280.2	1270.6	1358.6	1360.9			
Grab Breaking Load (lb) :	334.3	341.0	353.6	289.7	267.0	<b>308.5</b>	27.6	<b>8.9</b>
	314.8	287.8	285.6	305.4	305.9			
Elongation at break (%) :	76.4	72.7	71.1	69.3	62.7	<b>72.2</b>	4.3	<b>6.0</b>
	73.0	71.1	77.0	77.1	71.8			

Prepared by:

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 Catherine Groleau Rivard, Tech.  
 Technician

Approved by: Sylvie Dalpé

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 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Trapezoid Tearing Strength of Geotextiles ASTM D4533/D4533M-15

**TEST CONDITIONS:** Conditioned sample(s) (21°C, 65 % R.H.);  
 Apparatus used: Dynamometer with a Constant Rate of Extension (CRE);  
 Condition of the test specimens: dry;  
 Notch length: 15.9 mm;  
 10 test specimens per direction;  
 Tested March 31 and April 03, 2017

**RESULTS:** Individual Data Avg. S.D. % CV

**A-1 Roll 030593660**

**MACHINE DIRECTION**

	478.5	519.2	460.7	417.3	396.8	<b>484.6</b>	66.4	<b>13.7</b>
Tearing Strength (N):	427.6	450.3	532.4	572.5	590.2			
Tearing Strength (lb):	107.6	116.7	103.6	93.8	89.2	<b>108.9</b>	14.9	<b>13.7</b>
	96.1	101.2	119.7	128.7	132.7			

**CROSS DIRECTION**

	478.0	545.7	533.3	529.1	533.1	<b>538.6</b>	36.5	<b>6.8</b>
Tearing Strength (N):	618.0	520.1	573.3	531.1	524.7			
Tearing Strength (lb):	107.4	122.7	119.9	118.9	119.8	<b>121.1</b>	8.2	<b>6.8</b>
	138.9	116.9	128.9	119.4	118.0			

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 Technician

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Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95379A

**IDENTIFICATION:** Geotextile Type A: A-1 Roll 030593660, A-2 Roll 030593648, A-3 Roll 030593665, A-4 Roll 030593654  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Trapezoid Tearing Strength of Geotextiles ASTM D4533/D4533M-15

**RESULTS (CONT):** Individual Data Avg. S.D. % CV

**A-2 Roll 030593648**

**MACHINE DIRECTION**

Tearing Strength (N): 480.7 540.5 436.7 480.7 452.9 **495.9** 41.7 **8.4**  
 468.0 477.5 519.6 547.5 554.8

Tearing Strength (lb): 108.1 121.5 98.2 108.1 101.8 **111.5** 9.4 **8.4**  
 105.2 107.3 116.8 123.1 124.7

**CROSS DIRECTION**

Tearing Strength (N) : 522.8 492.9 582.8 457.3 568.5 **522.2** 42.7 **8.2**  
 545.2 468.6 491.7 540.1 552.1

Tearing Strength (lb) : 117.5 110.8 131.0 102.8 127.8 **117.4** 9.6 **8.2**  
 122.6 105.3 110.5 121.4 124.1

**A-3 Roll 030593665**

**MACHINE DIRECTION**

Tearing Strength (N): 563.4 445.4 498.8 447.5 437.8 **473.2** 48.7 **10.3**  
 419.4 438.8 444.5 539.4 497.2

Tearing Strength (lb): 126.6 100.1 112.1 100.6 98.4 **106.4** 10.9 **10.3**  
 94.3 98.6 99.9 121.3 111.8

**CROSS DIRECTION**

Tearing Strength (N) : 525.1 509.5 494.1 513.6 498.1 **480.2** 46.0 **9.6**  
 513.6 488.6 456.4 415.3 387.4

Tearing Strength (lb) : 118.0 114.5 111.1 115.5 112.0 **108.0** 10.3 **9.6**  
 115.5 109.8 102.6 93.4 87.1

Prepared by:

Nora Boudjedaini,  
 Technician

Approved by: Sylvie Dalpé

For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

**\*\*For any information concerning this report, please contact Eric Blond\*\***

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95379A

**IDENTIFICATION:** Geotextile Type A: A-1 Roll 030593660, A-2 Roll 030593648, A-3 Roll 030593665, A-4 Roll 030593654  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Trapezoid Tearing Strength of Geotextiles ASTM D4533/D4533M-15

**RESULTS (CONT):** Individual Data Avg. S.D. % CV

**A-4 Roll 030593654**

**MACHINE DIRECTION**

	526.4	438.7	482.9	470.8	425.4	<b>461.6</b>	41.5	<b>9.0</b>
Tearing Strength (N):	414.1	485.4	497.9	479.3	394.7			
Tearing Strength (lb):	118.3	98.6	108.6	105.8	95.6	<b>103.7</b>	9.3	<b>9.0</b>
	93.1	109.1	111.9	107.7	88.7			

**CROSS DIRECTION**

	538.8	705.6	659.8	515.3	634.5	<b>571.1</b>	76.3	<b>13.4</b>
Tearing Strength (N) :	560.6	605.5	479.9	506.9	503.7			
Tearing Strength (lb) :	121.1	158.6	148.3	115.8	142.6	<b>128.4</b>	17.2	<b>13.4</b>
	126.0	136.1	107.9	113.9	113.2			

Prepared by:

  
 Nora Boudjedaimi,  
 Technician

Approved by: Sylvie Dalpé

  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95379A

**IDENTIFICATION:** Geotextile Type A: A-1 Roll 030593660, A-2 Roll 030593648, A-3 Roll 030593665, A-4 Roll 030593654  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Index Puncture Resistance of Geotextiles, Geomembranes and Related Products ASTM D4833 - 00

**TEST CONDITIONS:** Conditioned sample(s) (21°C, 65 % R.H.);  
 Apparatus used: Dynamometer with a Constant Rate of Extension (CRE);  
 Method of holding the specimen as described in the test method;  
 Tested March 31, 2017

**RESULTS:** Individual Data Avg. S.D. % CV

**A-1 Roll 030593660**

	900.8	765.0	779.5	765.1	875.4	<b>812.7</b>	67.1	<b>8.3</b>
Puncture resistance (N):	783.0	746.9	724.4	769.6	792.3			
	850.4	867.8	758.2	959.0	852.5			

	202.5	172.0	175.2	172.0	196.8	<b>182.7</b>	15.1	<b>8.3</b>
Puncture resistance (lb):	176.0	167.9	162.8	173.0	178.1			
	191.2	195.1	170.5	215.6	191.6			

**A-2 Roll 030593648**

	784.7	764.7	758.7	801.8	886.8	<b>775.1</b>	72.5	<b>9.3</b>
Puncture resistance (N):	779.3	660.1	629.2	750.8	673.6			
	803.8	836.0	831.8	829.0	836.7			

	176.4	171.9	170.5	180.3	199.3	<b>174.2</b>	16.3	<b>9.4</b>
Puncture resistance (lb):	175.2	148.4	141.4	168.8	151.4			
	180.7	187.9	187.0	186.4	188.1			

**A-3 Roll 030593665**

	788.9	810.4	844.2	757.3	843.5	<b>774.3</b>	51.6	<b>6.7</b>
Puncture resistance (N):	851.1	677.7	709.9	783.4	772.9			
	754.7	763.0	768.4	699.7	789.3			

	177.4	182.2	189.8	170.2	189.6	<b>174.0</b>	11.6	<b>6.7</b>
Puncture resistance (lb):	191.3	152.3	159.6	176.1	173.7			
	169.6	171.5	172.7	157.3	177.4			

Prepared by:

Nora Boudjedaimi,  
 Technician

Approved by: Sylvie Dalpé

For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95379A

**IDENTIFICATION:** Geotextile Type A: A-1 Roll 030593660, A-2 Roll 030593648, A-3 Roll 030593665, A-4 Roll 030593654  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

TEST:	Index Puncture Resistance of Geotextiles, Geomembranes and Related Products					ASTM D4833 - 00			
RESULTS (CONT):	Individual Data					Avg.	S.D.	% CV	
<b>A-4 Roll 030593654</b>									
Puncture resistance (N):	820.1	749.1	702.8	888.2	771.8	<b>779.7</b>	62.9	<b>8.1</b>	
	789.7	869.7	815.8	830.4	795.5				
	727.4	691.5	734.5	821.1	688.0				
Puncture resistance (lb):	184.4	168.4	158.0	199.7	173.5	<b>175.3</b>	14.1	<b>8.1</b>	
	177.5	195.5	183.4	186.7	178.8				
	163.5	155.4	165.1	184.6	154.7				

Prepared by:

  
 Nora Boudjedaimi,  
 Technician

Approved by: Sylvie Dalpé

  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95379A

**IDENTIFICATION:** Geotextile Type A: A-1 Roll 030593660, A-2 Roll 030593648, A-3 Roll 030593665, A-4 Roll 030593654  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Bursting Strength of Textile Fabrics - Diaphragm Bursting Strength Tester Method ASTM D3786/D3786M-13

**TEST CONDITIONS:** Conditioned sample(s) (21°C, 65 % R.H.);  
 Apparatus used: Bursting Tester (Mullen), Type "AH"; Pumping rate: 170 ml/min;  
 Measuring unit of the equipment: psi;  
 Maximum capacity of the gauge (psi): 1500  
 Tested March 30, 2017

**RESULTS:**

	Individual Data					Avg.	S.D.	% CV
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**A-1 Roll 030593660**

Bursting Strength (psi):	498	492	442	517	492	<b>502</b>	26	<b>5.1</b>
	517	530	530	498	505			

Bursting Strength (kPa):	3434	3392	3048	3565	3392	<b>3 461</b>	175	<b>5.1</b>
	3565	3651	3651	3434	3479			

**A-2 Roll 030593648**

Bursting Strength (psi):	480	455	467	518	444	<b>471</b>	37	<b>7.9</b>
	463	395	476	481	527			

Bursting Strength (kPa):	3306	3134	3220	3572	3061	<b>3 243</b>	255	<b>7.9</b>
	3192	2724	3279	3316	3630			

**A-3 Roll 030593665**

Bursting Strength (psi):	526	526	551	514	464	<b>503</b>	42	<b>8.3</b>
	439	501	519	439	552			

Bursting Strength (kPa):	3623	3623	3796	3544	3199	<b>3 467</b>	288	<b>8.3</b>
	3027	3451	3579	3027	3803			

Prepared by:

*Nancy Fontaine*  
 Nancy Fontaine, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafox Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95379A

**IDENTIFICATION:** Geotextile Type A: A-1 Roll 030593660, A-2 Roll 030593648, A-3 Roll 030593665, A-4 Roll 030593654  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Bursting Strength of Textile Fabrics - Diaphragm Bursting Strength Tester Method      ASTM D3786/D3786M-13

RESULTS (CONT):	Individual Data					Avg.	S.D.	% CV
<b>A-4 Roll 030593654</b>								
Bursting Strength (psi):	538	538	488	551	488	<b>498</b>	42	<b>8.4</b>
	501	514	427	433	502			
Bursting Strength (kPa):	3710	3710	3365	3796	3365	<b>3 432</b>	289	<b>8.4</b>
	3451	3544	2941	2982	3458			

Prepared by:

*Nancy Fontaine*  
 Nancy Fontaine, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95379A

**IDENTIFICATION:** Geotextile Type A: A-1 Roll 030593660  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Determining Apparent Opening Size of a Geotextile ASTM D4751 - 16 Meth. A

**TEST CONDITIONS:** Method A: Dry-Sieving with glass beads.  
 Apparatus used: Sieve shaker ROTAP, model RX-29;  
 Beads size ranges used (mm): 0.106 and 0.150  
 Tested April 3 and 4, 2017

RESULTS:	Individual Data					Avg.	S.D.	% CV
	21.1	21.2	21.5	22.3	20.1			
Weight of the specimen (g):	21.1	21.2	21.5	22.3	20.1			
AOS-A (mm):	0.150	0.150	0.150	0.150	0.150	<b>0.150</b>	0.000	<b>0.0</b>
Theoretical bead size (mm):	0.144	0.144	0.136	0.129	0.140	<b>0.139</b>	0.006	<b>4.6</b>

Prepared by:

  
 Suzie Côté, P.T.  
 Technician

Approved by: Sylvie Dalpé

  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95379A

**IDENTIFICATION:** Geotextile Type A: A-1 Roll 030593660  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Water Permeability of Geotextiles by Permittivity ASTM D4491/D4491M-15


**TEST CONDITIONS:** Method A: Constant Head Test;  
 Temperature of the water (°C): 20.5  
 Flow diameter (mm) 54  
 Tested April 3, 2017

RESULTS:	Individual Data				Avg.	S.D.	% CV
Thickness (mm):	3.25	3.63	3.78	3.56			
Permeability (E-01 cm/s):	3.8	4.3	3.7	3.5	<b>3.8</b>	0.3	<b>8.9</b>
Permittivity (s <sup>-1</sup> ):	1.2	1.2	0.97	0.98	<b>1.09</b>	0.13	<b>12.0</b>
Flow Rate under 51 mm hydraulic head (gal./min/ft <sup>2</sup> ):	89.7	90.4	74.2	74.4	<b>82.2</b>	9.1	<b>11.1</b>

Prepared by:

  
 Suzie Côté, P.T.  
 Technician

Approved by: Sylvie Dalpé

  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
Report: S078-087-95379A

**IDENTIFICATION:** Geotextile Type A: A-1 Roll 030593660  
Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus ASTM D4355-14

**TEST CONDITIONS:** Mechanical test: Conditioning: 21°C, 65 % R.H.; Apparatus used: dynamometer (CRE); Speed: 305 mm/min; 5 test specimens/direction sampled after exposure (2" width); MD: Machine direction and/or CD: Cross direction; Exposition: Apparatus used: Water-cooled xenon arc lamp apparatus; Exposition cycle: 90 min of light only, followed by 30 min of water spray and light; Temperature of the black pannel: 65 ± 3°C, 50 ± 10% R.H.; Irradiation: 0.35 W/m<sup>2</sup>/nm @ 340 nm; Inner Filter: borosilicate; Age at the beginning of the exposure (hours): 29 Outer Filter: borosilicate; Age at the beginning of the exposure (hours): 1029 Tested from April 27 to May 19, 2017 (UV exposure) and May 24, 2017 (Tensile tests)

**RESULTS:** Individual Data Avg. S.D. % CV

**AVERAGE RESIDUAL PROPERTIES** ...

After an exposure period of 500 h ...

MD; Retained Strength (%): 74.0

CD; Retained Strength (%): 65.0

**INDIVIDUALS RESULTS** ...

MD; Breaking Strength-Initial (N):	1036.1	1059.7	1272.1	1128.7	973.4	<b>1 094.0</b>	114.0	<b>10.4</b>
MD; Elongation at break-Initial (%):	59.0	60.9	64.8	68.0	71.6	<b>64.9</b>	5.1	<b>7.9</b>
CD; Breaking Strength-Initial (N):	1132.5	1158.1	1298.5	1193.8	1249.1	<b>1 206.4</b>	67.6	<b>5.6</b>
CD; Elongation at break-Initial (%):	78.4	81.0	75.6	66.9	71.0	<b>74.6</b>	5.7	<b>7.6</b>
MD; Breaking Strength-500h (N):	737.1	781.6	992.7	831.3	703.8	<b>809.3</b>	113.2	<b>14.0</b>
MD; Elongation at break-500h (%):	44.2	46.9	48.7	47.4	54.2	<b>48.3</b>	3.7	<b>7.6</b>
CD; Breaking Strength-500h (N):	774.1	749.9	819.0	943.0	634.9	<b>784.2</b>	111.8	<b>14.3</b>
CD; Elongation at break-500h (%):	60.5	56.8	57.5	55.7	48.3	<b>55.8</b>	4.5	<b>8.1</b>

Prepared by:

*Catherine Groleau Rivard*  
Catherine Groleau Rivard, Tech.  
Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
For: Eric Blond, Eng., M.Sc.A.  
Vice-President

Date: May 25, 2017

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# Appendix E1.2 Type B Geotextile



**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95380A

**IDENTIFICATION:** Geotextile Type B: B-1 Roll 030593685, B-2 Roll 030593687  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Mass per Unit Area of Geotextiles ASTM D5261 - 10

**TEST CONDITIONS:** Conditioned sample(s) (21°C, 65% R.H.);  
 10 test specimens of circular shape per product ;  
 Surface used (cm<sup>2</sup>): 100  
 Tested March 30, 2017

**RESULTS:** Individual Data Avg. S.D. % CV

**B-1 Roll 030593685**

Mass per unit area (g/m <sup>2</sup> ):	498	542	490	558	600	<b>524</b>	37	<b>7.0</b>
	532	472	519	505	522			

Mass per unit area (oz./yd. <sup>2</sup> ):	30.1	32.0	33.4	32.8	31.4	<b>32.7</b>	1.6	<b>4.8</b>
	34.4	31.9	35.6	32.1	33.0			

**B-2 Roll 030593687**

Mass per unit area (g/m <sup>2</sup> ):	490	481	496	517	522	<b>498</b>	22	<b>4.4</b>
	538	487	485	464	503			

Mass per unit area (oz./yd. <sup>2</sup> ):	34.1	33.0	33.0	31.5	33.0	<b>32.9</b>	1.0	<b>2.9</b>
	32.6	33.9	34.3	32.2	31.7			

Prepared by:

*Nancy Désautels*  
 Nancy Désautels,  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95380A

**IDENTIFICATION:** Geotextile Type B: B-1 Roll 030593685, B-2 Roll 030593687  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Measuring the Nominal Thickness of Geosynthetics ASTM D5199-12

**TEST CONDITIONS:** Conditioned sample(s) (21 °C, 65 % R.H.);  
 Dimension of the test specimens: minimum diameter of 75 mm;  
 Apparatus: Frazier - measuring unit: inch (has precedence on the values in mm) ;  
 Procedure used: A  
 Diameter of the presser foot (mm): 57  
 Pressure applied (kPa): 2  
 Loading time interval: 5 sec. ;  
 Tested March 30, 2017

**RESULTS:** Individual Data Avg. S.D. % CV

**B-1 Roll 030593685**

Thickness (mils):	169	184	168	171	185	<b>173</b>	9	<b>5.0</b>
	182	158	167	170	178			

Thickness (mm):	4.29	4.67	4.27	4.34	4.70	<b>4.40</b>	0.22	<b>5.0</b>
	4.62	4.01	4.24	4.32	4.52			

**B-2 Roll 030593687**

Thickness (mils):	166	162	173	172	169	<b>168</b>	6	<b>3.6</b>
	176	162	168	157	173			

Thickness (mm):	4.22	4.11	4.39	4.37	4.29	<b>4.26</b>	0.15	<b>3.6</b>
	4.47	4.11	4.27	3.99	4.39			

Prepared by:

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 Nancy Desautels,  
 Technician

Approved by: Sylvie Dalpé

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 Vice-President

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Date: May 25, 2017  
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**IDENTIFICATION:** Geotextile Type B: B-1 Roll 030593685, B-2 Roll 030593687  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Grab Breaking Load and Elongation of Geotextiles ASTM D4632/D4632M-15a

**TEST CONDITIONS:** Apparatus used: Dynamometer with a Constant Rate of Extension (CRE);  
 Grip surface texture: rubber;  
 Speed: 300 mm/min;  
 Full scale range used: 5kN  
 10 test specimens per direction ;  
 Conditioned sample(s) (21°C, 65 % R.H.) ;  
 Tested March 30, 2017

**RESULTS:** Individual Data Avg. S.D. % CV

**B-1 Roll 030593685**

**MACHINE DIRECTION** ...

Grab Breaking Load (N):	2159.6	1839.7	1727.0	1597.0	1689.0	<b>1 801.1</b>	166.4	<b>9.2</b>
	1790.3	1853.8	1631.1	1962.7	1761.1			
Grab Breaking Load (lb):	485.5	413.6	388.2	359.0	379.7	<b>404.9</b>	37.4	<b>9.2</b>
	402.5	416.7	366.7	441.2	395.9			
Elongation at break (%):	58.4	63.6	62.8	64.5	63.2	<b>64.1</b>	4.5	<b>7.0</b>
	65.1	63.4	75.1	59.3	65.3			

**CROSS DIRECTION** ...

Grab Breaking Load (N) :	2131.6	2084.9	1726.0	1817.7	1812.4	<b>1 793.4</b>	230.6	<b>12.9</b>
	1773.0	1471.7	1393.9	1884.3	1838.7			
Grab Breaking Load (lb) :	479.2	468.7	388.0	408.6	407.4	<b>403.2</b>	51.9	<b>12.9</b>
	398.6	330.8	313.3	423.6	413.3			
Elongation at break (%) :	80.1	73.0	68.8	70.0	69.2	<b>75.9</b>	6.9	<b>9.1</b>
	76.1	88.4	83.6	80.1	69.9			

Prepared by:

*Catherine Groleau Rivard*  
 Catherine Groleau Rivard, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95380A

**IDENTIFICATION:** Geotextile Type B: B-1 Roll 030593685, B-2 Roll 030593687  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Grab Breaking Load and Elongation of Geotextiles . . . . . ASTM D4632/D4632M-15a

**RESULTS (CONT):** . . . . . Individual Data . . . . . Avg. . . . . S.D. . . . . % CV

**B-2 Roll 030593687**

**MACHINE DIRECTION** . . . . .

Grab Breaking Load (N):	1896.3	1487.6	1798.6	1665.2	1685.0	<b>1 773.5</b>	133.2	<b>7.5</b>
	1796.4	1889.3	1804.1	1773.0	1939.9			
Grab Breaking Load (lb):	426.3	334.4	404.3	374.3	378.8	<b>398.7</b>	29.9	<b>7.5</b>
	403.8	424.7	405.6	398.6	436.1			
Elongation at break (%):	63.8	64.1	69.4	62.1	67.7	<b>65.2</b>	2.8	<b>4.3</b>
	67.8	66.7	65.9	60.5	63.8			

**CROSS DIRECTION** . . . . .

Grab Breaking Load (N) :	2040.2	2063.0	1916.8	2112.1	1848.5	<b>2 005.4</b>	86.1	<b>4.3</b>
	1978.7	1934.8	2096.2	1992.5	2070.9			
Grab Breaking Load (lb) :	458.6	463.8	430.9	474.8	415.5	<b>450.8</b>	19.4	<b>4.3</b>
	444.8	434.9	471.2	447.9	465.5			
Elongation at break (%) :	74.9	71.9	70.8	76.0	68.9	<b>75.2</b>	3.6	<b>4.8</b>
	75.1	80.2	77.4	78.6	77.8			

Prepared by:

*Catherine Groleau Rivard*  
 Catherine Groleau Rivard, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95380A

**IDENTIFICATION:** Geotextile Type B: B-1 Roll 030593685, B-2 Roll 030593687  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Trapezoid Tearing Strength of Geotextiles ASTM D4533/D4533M-15

**TEST CONDITIONS:** Conditioned sample(s) (21°C, 65 % R.H.);  
 Apparatus used: Dynamometer with a Constant Rate of Extension (CRE);  
 Condition of the test specimens: dry;  
 Notch length: 15.9 mm;  
 10 test specimens per direction;  
 Tested March 31, 2017

**RESULTS:** Individual Data Avg. S.D. % CV

**B-1 Roll 030593685**

**MACHINE DIRECTION**

	752.7	669.0	666.6	528.9	607.5	<b>630.4</b>	64.7	<b>10.3</b>
Tearing Strength (N):	604.1	585.2	567.1	646.4	676.4			
Tearing Strength (lb):	169.2	150.4	149.8	118.9	136.6	<b>141.7</b>	14.5	<b>10.3</b>
	135.8	131.5	127.5	145.3	152.0			

**CROSS DIRECTION**

	685.1	728.0	718.0	616.7	704.7	<b>685.4</b>	54.1	<b>7.9</b>
Tearing Strength (N) :	759.9	593.4	720.7	630.7	697.1			
Tearing Strength (lb) :	154.0	163.7	161.4	138.6	158.4	<b>154.1</b>	12.2	<b>7.9</b>
	170.8	133.4	162.0	141.8	156.7			

Prepared by:

  
 Nora Boudjedaimi,  
 Technician

Approved by:

Sylvie Dalpé

  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Trapezoid Tearing Strength of Geotextiles ASTM D4533/D4533M-15

**RESULTS (CONT):** Individual Data Avg. S.D. % CV

**B-2 Roll 030593687**

**MACHINE DIRECTION**

	Individual Data					Avg.	S.D.	% CV
Tearing Strength (N):	633.0	562.3	594.6	647.7	585.4	<b>643.6</b>	58.8	<b>9.1</b>
	740.5	608.2	651.5	709.2	703.3			
Tearing Strength (lb):	142.3	126.4	133.7	145.6	131.6	<b>144.7</b>	13.2	<b>9.1</b>
	166.5	136.7	146.5	159.4	158.1			


**CROSS DIRECTION**

	Individual Data					Avg.	S.D.	% CV
Tearing Strength (N) :	752.8	814.0	794.3	708.8	743.5	<b>753.6</b>	43.8	<b>5.8</b>
	773.9	713.4	731.2	691.5	812.8			
Tearing Strength (lb) :	169.2	183.0	178.6	159.3	167.1	<b>169.4</b>	9.9	<b>5.8</b>
	174.0	160.4	164.4	155.4	182.7			

Prepared by:

  
 Nora Boudjedjami,  
 Technician

Approved by: Sylvie Dalpé

  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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Date: May 25, 2017  
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**IDENTIFICATION:** Geotextile Type B: B-1 Roll 030593685, B-2 Roll 030593687  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Index Puncture Resistance of Geotextiles, Geomembranes and Related Products      ASTM D4833 - 00

**TEST CONDITIONS:** Conditioned sample(s) (21°C, 65 % R.H.);  
 Apparatus used: Dynamometer with a Constant Rate of Extension (CRE);  
 Method of holding the specimen as described in the test method;  
 Tested March 31, 2017

RESULTS:	Individual Data					Avg.	S.D.	% CV
<b>B-1 Roll 030593685</b>								
Puncture resistance (N):	1213.8	1094.3	1036.0	1141.8	1188.8	<b>1 123.8</b>	81.3	<b>7.2</b>
	1306.6	1099.3	1205.1	1106.8	1088.4			
	1151.2	1136.3	1030.7	1057.4	1000.8			
Puncture resistance (lb):	272.9	246.0	232.9	256.7	267.2	<b>252.6</b>	18.3	<b>7.2</b>
	293.7	247.1	270.9	248.8	244.7			
	258.8	255.4	231.7	237.7	225.0			
<b>B-2 Roll 030593687</b>								
Puncture resistance (N):	1156.2	1156.2	1137.5	1171.2	1281.5	<b>1 146.2</b>	90.3	<b>7.9</b>
	1119.0	1334.5	989.3	1234.9	1158.5			
	1052.8	1088.8	1156.0	1127.3	1029.6			
Puncture resistance (lb):	259.9	259.9	255.7	263.3	288.1	<b>257.7</b>	20.3	<b>7.9</b>
	251.6	300.0	222.4	277.6	260.4			
	236.7	244.8	259.9	253.4	231.5			

Prepared by:

  
 Nora Boudjedaini,  
 Technician

Approved by: Sylvie Dalpé

  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
 Report: S078-087-95380A

**IDENTIFICATION:** Geotextile Type B: B-1 Roll 030593685, B-2 Roll 030593687  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Bursting Strength of Textile Fabrics - Diaphragm Bursting Strength Tester Method ASTM D3786/D3786M-13

**TEST CONDITIONS:** Conditioned sample(s) (21°C, 65 % R.H.);  
 Apparatus used: Bursting Tester (Mullen), Type "AH"; Pumping rate: 170 ml/min;  
 Measuring unit of the equipment: psi;  
 Maximum capacity of the gauge (psi): 1500  
 Tested March 30, 2017

RESULTS:	Individual Data					Avg.	S.D.	% CV
<b>B-1 Roll 030593685</b>								
Bursting Strength (psi):	651	651	657	751	588	<b>701</b>	63	<b>9.0</b>
	713	719	788	719	776			
Bursting Strength (kPa):	4485	4485	4527	5175	4054	<b>4 834</b>	437	<b>9.0</b>
	4916	4958	5433	4958	5347			
<b>B-2 Roll 030593687</b>								
Bursting Strength (psi):	669	652	689	701	677	<b>701</b>	38	<b>5.4</b>
	782	738	677	714	713			
Bursting Strength (kPa):	4613	4492	4751	4830	4664	<b>4 833</b>	262	<b>5.4</b>
	5388	5089	4664	4923	4916			

Prepared by:

*Nancy Fontaine*  
 Nancy Fontaine, Tech.  
 Technician

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 Vice-President

Date: May 25, 2017

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Date: May 25, 2017  
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**IDENTIFICATION:** Geotextile Type B: B-1 Roll 030593685  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Determining Apparent Opening Size of a Geotextile ASTM D4751 - 16 Meth. A

**TEST CONDITIONS:** Method A: Dry-Sieving with glass beads.  
 Apparatus used: Sieve shaker ROTAP, model RX-29;  
 Beads size ranges used (mm): 0.075 , 0.106 and 0.150  
 Tested April 4, 2017

RESULTS:	Individual Data					Avg.	S.D.	% CV
Weight of the specimen (g):	30.4	24.3	26.6	25.4	25.3			
AOS-A (mm):	0.106	0.150	0.150	0.150	0.150	<b>0.141</b>	0.020	<b>13.9</b>
Theoretical bead size (mm):	0.105	0.144	0.136	0.139	0.140	<b>0.133</b>	0.016	<b>11.9</b>

Prepared by:

  
 Suzie Côté, P.T.  
 Technician

Approved by: Sylvie Dalpé

  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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Date: May 25, 2017  
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**IDENTIFICATION:** Geotextile Type B: B-1 Roll 030593685  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Water Permeability of Geotextiles by Permittivity ASTM D4491/D4491M-15

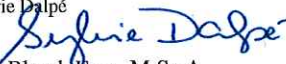
**TEST CONDITIONS:** Method A: Constant Head Test;  
 Temperature of the water (°C): 21.0  
 Flow diameter (mm) 54  
 Tested April 3, 2015

RESULTS:	Individual Data				Avg.	S.D.	% CV
Thickness (mm):	4.32	4.47	4.78	4.37			
Permeability (E-01 cm/s):	4.1	3.4	3.5	4.0	<b>3.8</b>	0.4	<b>9.4</b>
Permittivity (s <sup>-1</sup> ):	0.94	0.77	0.73	0.91	<b>0.84</b>	0.10	<b>12.3</b>
Flow Rate under 51 mm hydraulic head (gal./min/ft <sup>2</sup> ):	72.4	58.8	56.2	69.8	<b>64.3</b>	8.0	<b>12.4</b>

Prepared by:

  
 Suzie Côté, P.T.  
 Technician

Approved by: Sylvie Dalpé

  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: May 25, 2017

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: May 25, 2017  
Report: S078-087-95380A

**IDENTIFICATION:** Geotextile Type B: B-1 Roll 030593685  
Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus ASTM D4355-14

**TEST CONDITIONS:** Mechanical test: Conditioning: 21°C, 65 % R.H.; Apparatus used: dynamometer (CRE); Speed: 305 mm/min; 5 test specimens/direction sampled after exposure (2" width); MD: Machine direction and/or CD: Cross direction; Exposition: Apparatus used: Water-cooled xenon arc lamp apparatus; Exposition cycle: 90 min of light only, followed by 30 min of water spray and light; Temperature of the black pannel: 65 ± 3°C, 50 ± 10% R.H.; Irradiation: 0.35 W/m<sup>2</sup>/nm @ 340 nm; Inner Filter: borosilicate; Age at the beginning of the exposure (hours): 29 Outer Filter: borosilicate; Age at the beginning of the exposure (hours): 1029 Tested from April 27 to May 19, 2017 (UV exposure) and May 24, 2017 (Tensile tests)

**RESULTS:** Individual Data Avg. S.D. % CV

**AVERAGE RESIDUAL PROPERTIES** ...

After an exposure period of 500 h ...

MD; Retained Strength (%): 77.9

CD; Retained Strength (%): 70.2

**INDIVIDUALS RESULTS** ...

MD; Breaking Strength-Initial (N): 2150.3 1381.6 1436.7 1658.7 1503.7 **1 626.2** 310.8 **19.1**

MD; Elongation at break-Initial (%): 61.5 65.1 63.0 58.2 58.0 **61.2** 3.1 **5.0**

CD; Breaking Strength-Initial (N): 1812.5 1915.5 1710.5 1570.4 1567.7 **1 715.3** 151.9 **8.9**

CD; Elongation at break-Initial (%): 86.2 57.1 70.0 72.1 76.9 **72.5** 10.6 **14.6**

MD; Breaking Strength-500h (N): 1601.2 1162.8 1089.6 1246.0 1233.3 **1 266.6** 197.2 **15.6**

MD; Elongation at break-500h (%): 47.3 55.5 50.2 44.0 44.3 **48.3** 4.8 **9.9**

CD; Breaking Strength-500h (N): 1401.1 1231.7 1175.0 1069.6 1142.3 **1 203.9** 124.8 **10.4**

CD; Elongation at break-500h (%): 71.6 54.5 57.7 57.5 69.3 **62.1** 7.8 **12.5**

Prepared by:

*Catherine Groleau Rivard*  
Catherine Groleau Rivard, Tech.  
Technician

Approved by:

Sylvie Dalpé

*Sylvie Dalpé*  
For: Eric Blond, Eng., M.Sc.A.  
Vice-President

Date: May 25, 2017

**\*\*For any information concerning this report, please contact Eric Blond\*\***

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## Appendix E1.3 Letter from the Manufacturer



**SKAPS Industries (Nonwoven Division)**  
335 Athena Drive  
Athens, GA 30601 (U.S.A.)  
Phone (706) 354-3700 Fax (706) 354-3737  
E-mail: info @skaps.com

Sales Office:  
Engineered Synthetics Products Inc.  
Phone: (770) 564-1857  
Fax: (770) 564-1818

Date: August 22<sup>nd</sup>, 2017

**Terrafix Environmental Technology Inc.**

455 Homer Avenue  
Toronto, Ontario M8W 4W9

**Ref : Terrapure Landfill**

**PO : CL1629-TerraPure**

**SUBJECT: Annual UV Resistance Testing for SKAPS Industries Products**

To whom it may concern,

This letter is to inform that SKAPS Industries certifies UV Resistance based on third party testing, annually. SKAPS Industries certifies its products to retain at least 70% of its strength after being exposed to direct UV for five-hundred (500) hours (ASTM D 4355). SKAPS Industries nonwoven geotextiles are composed of one-hundred percent virgin raw polypropylene material. Therefore, all GE and GT styled products are composed of identical raw polypropylene fibers.

Attached to this document is the third party annual testing result for UV Resistance performed in 2017 for SKAPS Industries' GE160. SKAPS Industries' GE style products supplied to the referenced project are heavier and thicker fabrics, therefore, will retain a greater amount of strength after exposed in the UV Resistance chamber in comparison to SKAPS GE160. SKAPS Industries certifies that the GE110 supplied to this project will meet or exceed the requirements of UV Resistance.

Please feel free to contact SKAPS Industries if you have any questions.

Regards,

**Kourosh Sabzevari**

Quality Control Manager



6/2/2017

**Mail To:**

**Kouros R. Sabzevari**  
**SKAPS Industries**  
335 Athena Drive  
Athens, Georgia 30601

email: kouros@skaps.com  
email: anurag@skaps.com

Dear Mr. Sabzevari:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs.  
TRI is pleased to submit this final report of the laboratory testing for the sample(s) listed below.

Project: **Third Party Testing - GE160 UV Resistance**

TRI Job Reference Number: 28417

Material(s) Tested: One, Skaps GE 160 Geotextile

Test(s) Requested: UV Resistance (ASTM D 4355)

**Bill To:**

<= Same

If you have any questions or require any additional information, please call us at 1-800-880-8378

Sincerely,

Mansukh Patel  
Laboratory Manager  
Geosynthetic Services Division  
[www.GeosyntheticTesting.com](http://www.GeosyntheticTesting.com)

\*Signature is on file

**GEOTEXTILE TEST RESULTS**  
 TRI Client: SKAPS Industries  
 Project: Third Party Testing - GE160 UV Resistance

Material: Skaps GE 160 Geotextile  
 Sample Identification: GE160  
 TRI Log #: 28417

PARAMETER	TEST REPLICATE NUMBER										STD.		
	1	2	3	4	5	6	7	8	9	10	MEAN	DEV.	COV
<b>UV Resistance (ASTM D 4355)</b>													
Strength Retained measured via strip tensile (ASTM D 5035)													
												<b>PERCENT RETAINED</b>	
MD - Tensile Strength (lbs) - B	245	219	214	193	183						<b>211</b>	24	11.47
MD - Tensile Strength (ppi) - B	123	110	107	97	92						<b>105</b>	12	
MD - Tensile Strength (N) - B	1090	975	952	859	814						<b>938</b>	108	
MD - Tensile Strength (kN/m) - B	21.5	19.2	18.7	16.9	16.0						<b>18.5</b>	2.1	
MD - Tensile Strength (lbs) - E	181	200	175	208	228						<b>198</b>	21	10.75
MD - Tensile Strength (ppi) - E	91	100	88	104	114						<b>99</b>	11	
MD - Tensile Strength (N) - E	805	890	779	926	1015						<b>883</b>	95	
MD - Tensile Strength (kN/m) - E	15.9	17.5	15.3	18.2	20.0						<b>17.4</b>	1.9	<b>94</b>
TD - Tensile Strength (lbs) - B	188	226	204	238	213						<b>214</b>	19	9.05
TD - Tensile Strength (ppi) - B	94	113	102	119	107						<b>107</b>	10	
TD - Tensile Strength (N) - B	837	1006	908	1059	948						<b>951</b>	86	
TD - Tensile Strength (kN/m) - B	16.5	19.8	17.9	20.8	18.7						<b>18.7</b>	1.7	
TD - Tensile Strength (lbs) - E	182	203	236	237	215						<b>215</b>	23	10.82
TD - Tensile Strength (ppi) - E	91	102	118	119	108						<b>107</b>	12	
TD - Tensile Strength (N) - E	810	903	1050	1055	957						<b>955</b>	103	
TD - Tensile Strength (kN/m) - E	15.9	17.8	20.7	20.8	18.8						<b>18.8</b>	2.0	<b>100</b>
MD - Elong. @ Max. Load (%) - B	74.0	83.0	79.0	75.0	73.0						<b>77</b>	4	
MD - Elong. @ Max. Load (%) - E	65.0	62.0	58.0	69.0	64.0						<b>64</b>	4	<b>83</b>
TD - Elong. @ Max. Load (%) - B	97.0	107.0	103.0	103.0	95.0						<b>101</b>	5	
TD - Elong. @ Max. Load (%) - E	85.0	93.0	83.0	94.0	81.0						<b>87</b>	6	<b>86</b>
B - Baseline Unexposed E - Exposed for 500 hours of ASTM D 4355 Cycle													
MD Machine Direction	TD Transverse Direction												

# Appendix E2

## Textured Geomembrane



**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**TerraFix Geosynthetics Inc.**

Date: April 21, 2017  
 Report: S078-087-95377A

**IDENTIFICATION:** Textured geomembrane: G-1 Roll 5-27654, G-2 Roll 5-27659, G-3 Roll 5-27656  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Core Thickness of Textured Geomembrane ASTM D5994/D5994-10(2015)e1

**TEST CONDITIONS:** Conditioned sample(s) (21 °C, 65 % R.H.);  
 Apparatus used: Mitutoyo - measuring unit: inch (has precedence on the values in mm) ;  
 Load applied: 0.56 N ;  
 Loading time: 5 sec. ;  
 10 test specimens per product ;  
 Tested March 31, 2017

**RESULTS:**

	Individual Data					Avg.	S.D.	% CV
--	-----------------	--	--	--	--	------	------	------

**G-1 Roll 5-27654**

Thickness (mils):	79	80	80	84	84	<b>82</b>	2	<b>2.8</b>
	84	79	81	83	85			

Thickness (mm):	2.00	2.03	2.04	2.13	2.14	<b>2.08</b>	0.06	<b>2.8</b>
	2.14	2.01	2.06	2.10	2.15			

**G-2 Roll 5-27659**

Thickness (mils):	79	76	79	78	81	<b>80</b>	2	<b>2.5</b>
	82	83	80	80	79			

Thickness (mm):	2.01	1.94	2.01	1.99	2.06	<b>2.03</b>	0.05	<b>2.3</b>
	2.07	2.11	2.04	2.03	2.00			

**G-3 Roll 5-27656**

Thickness (mils):	78	79	80	80	81	<b>80</b>	1	<b>1.2</b>
	81	81	80	80	81			

Thickness (mm):	1.97	2.01	2.03	2.04	2.05	<b>2.03</b>	0.03	<b>1.3</b>
	2.05	2.06	2.04	2.02	2.05			

Prepared by:

*Nancy Désautels*  
 Nancy Désautels,  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

**\*\*For any information concerning this report, please contact Eric Blond\*\***

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: April 21, 2017  
 Report: S078-087-95377A

**IDENTIFICATION:** Textured geomembrane: G-1 Roll 5-27654, G-2 Roll 5-27659, G-3 Roll 5-27656  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Density and Specific Gravity (Relative Density) of Plastics by Displacement ASTM D792-13 Method B

**TEST CONDITIONS:** Test method B;  
 Conditioned sample(s) minimum 24 hours at 21°C, 65% R.H. ;  
 Immersion liquid: Ethanol  
 Temperature of the immersion liquid (°C): 23.2  
 Tested March 31, 2017

RESULTS:	Individual Data		Avg.	S.D.	% CV
<b>G-1 Roll 5-27654</b>					
Density (g/cm <sup>3</sup> ):	0.948	0.948	<b>0.948</b>	0.000	<b>0.0</b>
-----					
<b>G-2 Roll 5-27659</b>					
Density (g/cm <sup>3</sup> ):	0.948	0.948	<b>0.948</b>	0.000	<b>0.0</b>
-----					
<b>G-3 Roll 5-27656</b>					
Density (g/cm <sup>3</sup> ):	0.948	0.948	<b>0.948</b>	0.000	<b>0.0</b>
-----					

Prepared by:

*Nancy Desautels*  
 Nancy Desautels,  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

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**Terrafix Geosynthetics Inc.**

Date: April 21, 2017  
 Report: S078-087-95377A

**IDENTIFICATION:** Textured geomembrane: G-1 Roll 5-27654, G-2 Roll 5-27659, G-3 Roll 5-27656  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Measuring the Asperity Height of Textured Geomembranes ASTM D7466/D7466M-10 (2015)e1

**TEST CONDITIONS:** Conditioned sample(s) (21 °C, 65 % R.H.);  
 Apparatus used: Dial gage with a precision of ± 0.001 inch;  
 Tested April 3, 2017

RESULTS:	Individual Data					Avg.	S.D.	% CV
<b>G-1 Roll 5-27654</b>								
Side A: Asperity Height (mm):	0.84	0.79	0.84	0.76	0.89	<b>0.82</b>	0.05	<b>6.2</b>
	0.86	0.81	0.86	0.76	0.74			
Side A: Asperity Height (inch):	0.033	0.031	0.033	0.030	0.035	<b>0.032</b>	0.002	<b>6.3</b>
	0.034	0.032	0.034	0.030	0.029			
Side B: Asperity Height (mm):	0.58	0.69	0.51	0.53	0.53	<b>0.56</b>	0.05	<b>9.4</b>
	0.53	0.53	0.58	0.56	0.53			
Side B: Asperity Height (inch):	0.023	0.027	0.020	0.021	0.021	<b>0.022</b>	0.002	<b>9.1</b>
	0.021	0.021	0.023	0.022	0.021			
<b>G-2 Roll 5-27659</b>								
Side A: Asperity Height (mm):	0.51	0.61	0.56	0.58	0.46	<b>0.56</b>	0.05	<b>8.3</b>
	0.56	0.53	0.58	0.61	0.56			
Side A: Asperity Height (inch):	0.020	0.024	0.022	0.023	0.018	<b>0.022</b>	0.002	<b>8.5</b>
	0.022	0.021	0.023	0.024	0.022			
Side B: Asperity Height (mm):	0.58	0.61	0.64	0.51	0.64	<b>0.59</b>	0.06	<b>10.2</b>
	0.69	0.58	0.53	0.51	0.61			
Side B: Asperity Height (inch):	0.023	0.024	0.025	0.020	0.025	<b>0.023</b>	0.002	<b>9.9</b>
	0.027	0.023	0.021	0.020	0.024			

Prepared by:

*Nancy Fontaine*  
 Nancy Fontaine, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

**\*\*For any information concerning this report, please contact Eric Blond\*\***

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Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: April 21, 2017  
 Report: S078-087-95377A

**IDENTIFICATION:** Textured geomembrane: G-1 Roll 5-27654, G-2 Roll 5-27659, G-3 Roll 5-27656  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Measuring the Asperity Height of Textured Geomembranes ASTM D7466/D7466M-10 (2015)e1

RESULTS (CONT):	Individual Data					Avg.	S.D.	% CV
<b>G-3 Roll 5-27656</b>								
Side A: Asperity Height (mm):	0.69	0.58	0.66	0.64	0.71	<b>0.62</b>	0.06	<b>9.4</b>
	0.58	0.61	0.56	0.53	0.61			
Side A: Asperity Height (inch):	0.027	0.023	0.026	0.025	0.028	<b>0.024</b>	0.002	<b>9.1</b>
	0.023	0.024	0.022	0.021	0.024			
Side B: Asperity Height (mm):	0.48	0.53	0.48	0.61	0.58	<b>0.54</b>	0.06	<b>11.2</b>
	0.56	0.46	0.51	0.51	0.64			
Side B: Asperity Height (inch):	0.019	0.021	0.019	0.024	0.023	<b>0.021</b>	0.002	<b>11.0</b>
	0.022	0.018	0.020	0.020	0.025			

Prepared by:

*Nancy Fontaine*  
 Nancy Fontaine, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

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Date: April 21, 2017  
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**IDENTIFICATION:** Textured geomembrane: G-1 Roll 5-27654, G-2 Roll 5-27659, G-3 Roll 5-27656  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembrane ASTM D6693/D6693M-04 (2015)e1

**TEST CONDITIONS:** Conditioned sample(s) (21±2°C);  
 5 die cut specimens per direction;  
 Apparatus used: Dynamometer with a Constant Rate of Extension (CRE);  
 Speed (mm/min): 50  
 Tested March 30, 2017

RESULTS:	Individual Data					Avg.	S.D.	% CV
<b>G-1 Roll 5-27654</b>								
MACHINE DIRECTION ..								
Strength at yield (kN/m):	38.8	37.4	39.6	37.8	37.5	<b>38.2</b>	0.9	<b>2.5</b>
Strength at yield (lb/in):	221	213	226	216	214	<b>218</b>	5	<b>2.5</b>
Elongation at yield (%):	16	15	17	16	17	<b>16</b>	1	<b>5.2</b>
Strength at break (kN/m):	48.4	44.9	53.1	52.3	47.3	<b>49.2</b>	3.4	<b>7.0</b>
Strength at break (lb/in):	276	256	303	299	270	<b>281</b>	20	<b>7.1</b>
Elongation at break (%):	560	510	610	620	550	<b>570</b>	45	<b>7.9</b>
CROSS DIRECTION ..								
Strength at yield (kN/m):	37.3	37.5	38.9	37.6	36.1	<b>37.5</b>	1.0	<b>2.7</b>
Strength at yield (lb/in):	213	214	222	214	206	<b>214</b>	6	<b>2.7</b>
Elongation at yield (%):	16	16	16	16	16	<b>16</b>	0	<b>0.0</b>
Strength at break (kN/m):	40.4	27.9	43.5	44.2	46.5	<b>40.5</b>	7.4	<b>18.2</b>
Strength at break (lb/in):	231	160	249	253	265	<b>232</b>	42	<b>18.1</b>
Elongation at break (%):	490	120	500	540	580	<b>446</b>	186	<b>41.6</b>

Prepared by:

*Nancy Fontaine*  
 Nancy Fontaine, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

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**Terrafix Geosynthetics Inc.**

Date: April 21, 2017  
 Report: S078-087-95377A

**IDENTIFICATION:** Textured geomembrane: G-1 Roll 5-27654, G-2 Roll 5-27659, G-3 Roll 5-27656  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembrane ASTM D6693/D6693M-04 (2015)e1

**RESULTS (CONT):** Individual Data Avg. S.D. % CV

**G-2 Roll 5-27659**

**MACHINE DIRECTION**

	36.1	36.2	38.1	36.0	35.7	36.4	1.0	2.6
Strength at yield (kN/m):	36.1	36.2	38.1	36.0	35.7	36.4	1.0	2.6
Strength at yield (lb/in):	206	207	218	206	204	208	6	2.7
Elongation at yield (%):	15	17	18	17	17	17	1	6.5
Strength at break (kN/m):	43.8	43.1	44.9	52.3	51.6	47.1	4.4	9.4
Strength at break (lb/in):	250	246	256	299	295	269	26	9.5
Elongation at break (%):	520	520	500	640	630	562	67	12.0

**CROSS DIRECTION**

	36.2	36.6	39.2	35.7	36.3	36.8	1.4	3.8
Strength at yield (kN/m):	36.2	36.6	39.2	35.7	36.3	36.8	1.4	3.8
Strength at yield (lb/in):	207	209	224	204	208	210	8	3.7
Elongation at yield (%):	16	16	16	16	16	16	0	0.0
Strength at break (kN/m):	45.6	41.2	34.3	43.5	42.8	41.5	4.3	10.4
Strength at break (lb/in):	261	235	196	248	244	237	25	10.4
Elongation at break (%):	580	500	390	550	530	510	73	14.3

Prepared by:

*Nancy Fontaine*  
 Nancy Fontaine, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: April 21, 2017  
Report: S078-087-95377A

**IDENTIFICATION:** Textured geomembrane: G-1 Roll 5-27654, G-2 Roll 5-27659, G-3 Roll 5-27656  
Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembrane ASTM D6693/D6693M-04 (2015)e1

**RESULTS (CONT):** Individual Data Avg. S.D. % CV

**G-3 Roll 5-27656**

**MACHINE DIRECTION**

	Individual Data					Avg.	S.D.	% CV
Strength at yield (kN/m):	35.6	36.0	36.9	35.8	35.2	<b>35.9</b>	0.6	<b>1.8</b>
Strength at yield (lb/in):	203	206	211	204	201	<b>205</b>	4	<b>1.9</b>
Elongation at yield (%):	17	17	17	17	18	<b>17</b>	0	<b>2.6</b>
Strength at break (kN/m):	45.7	48.5	53.2	53.0	42.8	<b>48.6</b>	4.5	<b>9.3</b>
Strength at break (lb/in):	261	277	303	303	245	<b>278</b>	26	<b>9.2</b>
Elongation at break (%):	540	560	590	610	480	<b>556</b>	50	<b>9.0</b>

**CROSS DIRECTION**

Strength at yield (kN/m):	37.7	38.2	38.5	37.3	36.6	<b>37.7</b>	0.8	<b>2.0</b>
Strength at yield (lb/in):	215	218	220	213	209	<b>215</b>	4	<b>2.0</b>
Elongation at yield (%):	16	16	17	17	17	<b>17</b>	1	<b>3.3</b>
Strength at break (kN/m):	43.9	45.3	33.7	39.2	29.9	<b>38.4</b>	6.6	<b>17.1</b>
Strength at break (lb/in):	251	259	192	224	171	<b>219</b>	38	<b>17.2</b>
Elongation at break (%):	560	570	390	490	350	<b>472</b>	99	<b>21.0</b>

Prepared by:

*Nancy Fontaine*  
Nancy Fontaine, Tech.  
Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
For: Eric Blond, Eng., M.Sc.A.  
Vice-President

Date: April 21, 2017

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: April 21, 2017  
 Report: S078-087-95377A

**IDENTIFICATION:** Textured geomembrane: G-1 Roll 5-27654, G-2 Roll 5-27659, G-3 Roll 5-27656  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Index Puncture Resistance of Geomembranes and Related Products ASTM D4833/D4833M - 07(2013)e1

**TEST CONDITIONS:** Conditioned sample(s) (21°C, 65 % R.H.)  
 Apparatus used: Dynamometer with a Constant Rate of Extension (CRE);  
 Method of holding the specimen as described in the test method;  
 Tested April 03, 2017

**RESULTS:** Individual Data Avg. S.D. % CV

**G-1 Roll 5-27654**

	786.7	813.8	814.8	804.6	799.6	<b>813.5</b>	15.2	<b>1.9</b>
Puncture resistance (N):	796.2	797.1	818.2	839.7	816.3			
	814.2	820.9	824.4	841.5	814.7			

Puncture resistance (lb):	176.9	182.9	183.2	180.9	179.7	<b>182.9</b>	3.4	<b>1.9</b>
	179.0	179.2	183.9	188.8	183.5			
	183.0	184.5	185.3	189.2	183.1			

**G-2 Roll 5-27659**

Puncture resistance (N):	816.6	799.3	781.8	808.3	793.2	<b>802.6</b>	11.5	<b>1.4</b>
	810.0	808.5	810.6	816.6	791.5			
	812.6	795.5	807.5	805.0	781.9			

Puncture resistance (lb):	183.6	179.7	175.7	181.7	178.3	<b>180.4</b>	2.6	<b>1.4</b>
	182.1	181.8	182.2	183.6	177.9			
	182.7	178.8	181.5	181.0	175.8			

**G-3 Roll 5-27656**

Puncture resistance (N):	797.6	793.0	770.1	776.5	784.0	<b>800.9</b>	20.0	<b>2.5</b>
	773.4	817.8	808.9	806.5	832.6			
	806.5	813.9	831.2	815.7	786.5			

Puncture resistance (lb):	179.3	178.3	173.1	174.6	176.2	<b>180.1</b>	4.5	<b>2.5</b>
	173.9	183.8	181.8	181.3	187.2			
	181.3	183.0	186.8	183.4	176.8			

Prepared by:

  
 Nora Boudjedaimi,  
 Technician

Approved by: Sylvie Dalpé

  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

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**Terrafix Geosynthetics Inc.**

Date: April 21, 2017  
 Report: S078-087-95377A

**IDENTIFICATION:** Textured geomembrane: G-1 Roll 5-27654, G-2 Roll 5-27659, G-3 Roll 5-27656  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Tear Resistance (Graves Tear) of Plastic Film and Sheeting ASTM D1004 - 13

**TEST CONDITIONS:**

Conditioned sample(s) (23±2°C, 50±10% R.H.) ;  
 Apparatus used: Dynamometer with a Constant Rate of Extension (CRE) ;  
 10 test specimens per direction ;  
 Tested March 31, 2017

**RESULTS:** Individual Data Avg. S.D. % CV

**G-1 Roll 5-27654**

**MACHINE DIRECTION**

	350	353	338	336	343	<b>343</b>	6	<b>1.7</b>
Tearing Strength (N):	350	339	345	338	342			
Specimen thickness (mm):	2.17	2.19	2.06	2.10	2.20	<b>2.12</b>	0.06	<b>2.6</b>
Maximum extension (mm):	20	22	20	22	21	<b>21</b>	1	<b>3.9</b>

**CROSS DIRECTION**

	322	311	331	333	340	<b>327</b>	8	<b>2.5</b>
Tearing Strength (N) :	333	322	326	323	327			
Specimen thickness (mm) :	1.99	2.07	2.13	2.07	2.14	<b>2.09</b>	0.06	<b>2.7</b>
Maximum extension (mm) :	21	21	20	21	20	<b>21</b>	1	<b>2.6</b>

Prepared by:

*Nancy Fontaine*  
 Nancy Fontaine, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

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Date: April 21, 2017  
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IDENTIFICATION: Textured geomembrane: G-1 Roll 5-27654, G-2 Roll 5-27659, G-3 Roll 5-27656  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

TEST: Tear Resistance (Graves Tear) of Plastic Film and Sheeting ASTM D1004 - 13

RESULTS (CONT): Individual Data Avg. S.D. % CV

**G-2 Roll 5-27659**

MACHINE DIRECTION

	325	338	344	348	350	Avg.	S.D.	% CV
Tearing Strength (N):	325	338	344	348	350	338	8	2.4
	338	329	331	335	340			
Specimen thickness (mm):	2.04	1.97	2.06	2.02	2.10	2.05	0.06	2.7
	2.15	2.05	1.98	2.10	2.03			
Maximum extension (mm):	22	23	22	22	21	22	1	3.1
	21	22	22	21	21			

CROSS DIRECTION

	303	316	318	325	344	Avg.	S.D.	% CV
Tearing Strength (N) :	303	316	318	325	344	317	13	4.2
	332	302	306	312	315			
Specimen thickness (mm) :	2.06	1.99	2.09	2.04	2.16	2.07	0.05	2.6
	2.13	2.02	2.01	2.10	2.09			
Maximum extension (mm) :	21	20	20	20	20	20	0	1.6
	20	20	20	20	20			

Prepared by:

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Date: April 21, 2017

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 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

STANDARD:

TEST: Tear Resistance (Graves Tear) of Plastic Film and Sheeting ASTM D1004 - 13

RESULTS (CONT): Individual Data Avg. S.D. % CV

**G-3 Roll 5-27656**

MACHINE DIRECTION

	Individual Data					Avg.	S.D.	% CV
Tearing Strength (N):	329	329	335	343	355	342	10	2.8
	339	344	357	340	349			
Specimen thickness (mm):	2.10	1.91	2.00	2.06	2.13	2.06	0.07	3.5
	2.10	2.00	2.05	2.12	2.13			
Maximum extension (mm):	22	21	22	22	22	22	0	1.4
	22	22	22	22	22			

CROSS DIRECTION

	Individual Data					Avg.	S.D.	% CV
Tearing Strength (N) :	322	323	328	321	335	325	6	2.0
	336	321	315	327	326			
Specimen thickness (mm) :	1.99	2.02	2.06	2.07	2.12	2.06	0.04	1.9
	2.10	2.09	2.03	2.06	2.07			
Maximum extension (mm) :	21	20	20	21	20	20	1	4.1
	19	21	20	19	19			

Prepared by:

*Nancy Fontaine*  
 Nancy Fontaine, Tech.  
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Approved by: Sylvie Dalpé

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 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

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 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Carbon Black Content in Olefin Plastics ASTM D1603-14

**TEST CONDITIONS:** As described in the test method;  
 The test specimens were sampled in the smooth edge of the membrane ;  
 Carbon black content includes residual inorganic matter ;  
 Tested March 30, 2017

RESULTS:	Individual Data		Avg.	S.D.	% CV
<b>G-1 Roll 5-27654</b>					
Carbon black content (%):	2.67	2.65	<b>2.66</b>	0.01	<b>0.5</b>
<b>G-2 Roll 5-27659</b>					
Carbon black content (%):	2.75	2.72	<b>2.74</b>	0.02	<b>0.8</b>
<b>G-3 Roll 5-27656</b>					
Carbon black content (%):	2.64	2.63	<b>2.64</b>	0.01	<b>0.3</b>

Prepared by:   
 Karine Tourchot,  
 Technician

Approved by: Sylvie Dalpé   
 For: Eric Blond, Eng., M.Sc.A. Date: April 21, 2017  
 Vice-President

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Date: April 21, 2017  
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 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics ASTM D5596 - 03 (2016)

**TEST CONDITIONS:** 5 test specimens (2 fields of view per specimen);  
 Method of preparation of the specimens: microtome;  
 Tested April 4, 2017

**RESULTS:** Individual Data

**G-1 Roll 5-27654**

Category:	1	1	1	1	1
	1	1	1	1	1

**G-2 Roll 5-27659**

Category:	1	1	1	1	1
	1	1	1	1	1

**G-3 Roll 5-27656**

Category:	1	1	1	1	1
	1	1	1	1	1

Prepared by: *Nancy Désautels*  
 Nancy Désautels,  
 Technician

Approved by: Sylvie Dalpé *Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

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 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry ASTM D3895-14

**TEST CONDITIONS:** Apparatus used: DSC autosampler Q100W/MFC Differential Scanning Calorimeter TA Instrument;  
 Type of cup: aluminium;  
 Test specimens prepared as per ASTM D4703 (molding by compression to a thickness of 0.25 mm) ;  
 Temperature (°C): 200  
 The tangent method is used to determine the oxidation-induction time ;  
 Sample blended by "two-roll milling" at 150°C for 2 1/2 minutes ;  
 Tested between March 30 and 31, 2017

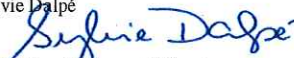
RESULTS:	Individual Data		Avg.	S.D.	% CV
<b>G-1 Roll 5-27654</b>					
OIT (min):	220	222	<b>221</b>	1	<b>0.6</b>
-----					
<b>G-2 Roll 5-27659</b>					
OIT (min):	216	217	<b>217</b>	1	<b>0.3</b>
-----					
<b>G-3 Roll 5-27656</b>					
OIT (min):	207	220	<b>214</b>	9	<b>4.3</b>
-----					

**REMARKS:** See graphs in appendix.

Prepared by:

  
 Karine Tourchot,  
 Technician

Approved by: Sylvie Dalpé

  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

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**IDENTIFICATION:** Textured geomembrane: G-1 Roll 5-27654, G-2 Roll 5-27659, G-3 Roll 5-27656  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Evaluation of Stress Crack Resistance of Polyolefin Geom. using Notched Constant Tensile Load Test ASTM D5397 - 07(2012) (App)

**TEST CONDITIONS:** Surfactant: CO-630; Test temperature: 50°C;  
 Residual thickness in the notched area: 80%;  
 Constant ligament-stress: 30% of the yield stress at room temperature ;  
 Nominal thickness considered (mils): 80  
 Exposition period (hours): 500  
 Tested from March 31 to April 21, 2017

**RESULTS:** Individual Data

**G-1 Roll 5-27654**

Test direction:	Cross				
Yield stress at room T° (psi):	2641.6				
Specimen thickness in the notched area (mils):	79.6	79.2	80.9	81.0	79.9
Ligament thickness (mils):	64.0				
Hours to Failure :	>500	>500	>500	>500	>500

**G-2 Roll 5-27659**

Test direction:	Cross				
Yield stress at room T° (psi):	2536.1				
Specimen thickness in the notched area (mils):	77.9	78.8	78.7	79.0	77.8
Ligament thickness (mils):	64.0				
Hours to Failure :	>500	>500	>500	>500	>500

Prepared by:

*Catherine Groleau Rivard*  
 Catherine Groleau Rivard, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

**\*\*For any information concerning this report, please contact Eric Blond\*\***

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: April 21, 2017  
 Report: S078-087-95377A

**IDENTIFICATION:** Textured geomembrane: G-1 Roll 5-27654, G-2 Roll 5-27659, G-3 Roll 5-27656  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**

**TEST:** Evaluation of Stress Crack Resistance of Polyolefin Geom. using Notched Constant Tensile Load Test      ASTM D5397 - 07(2012) (App)

**RESULTS (CONT):** Individual Data

**G-3 Roll 5-27656**

Test direction: Cross

Yield stress at room T° (psi): 2488.3

Specimen thickness in the notched area (mils): 78.1    78.3    79.7    78.5    79.6

Ligament thickness (mils): 64.0

Hours to Failure : >500    >500    >500    >500    >500

Prepared by:

*Catherine Groleau Rivard*  
 Catherine Groleau Rivard, Tech.  
 Technician

Approved by: Sylvie Dalpé

*Sylvie Dalpé*  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: April 21, 2017

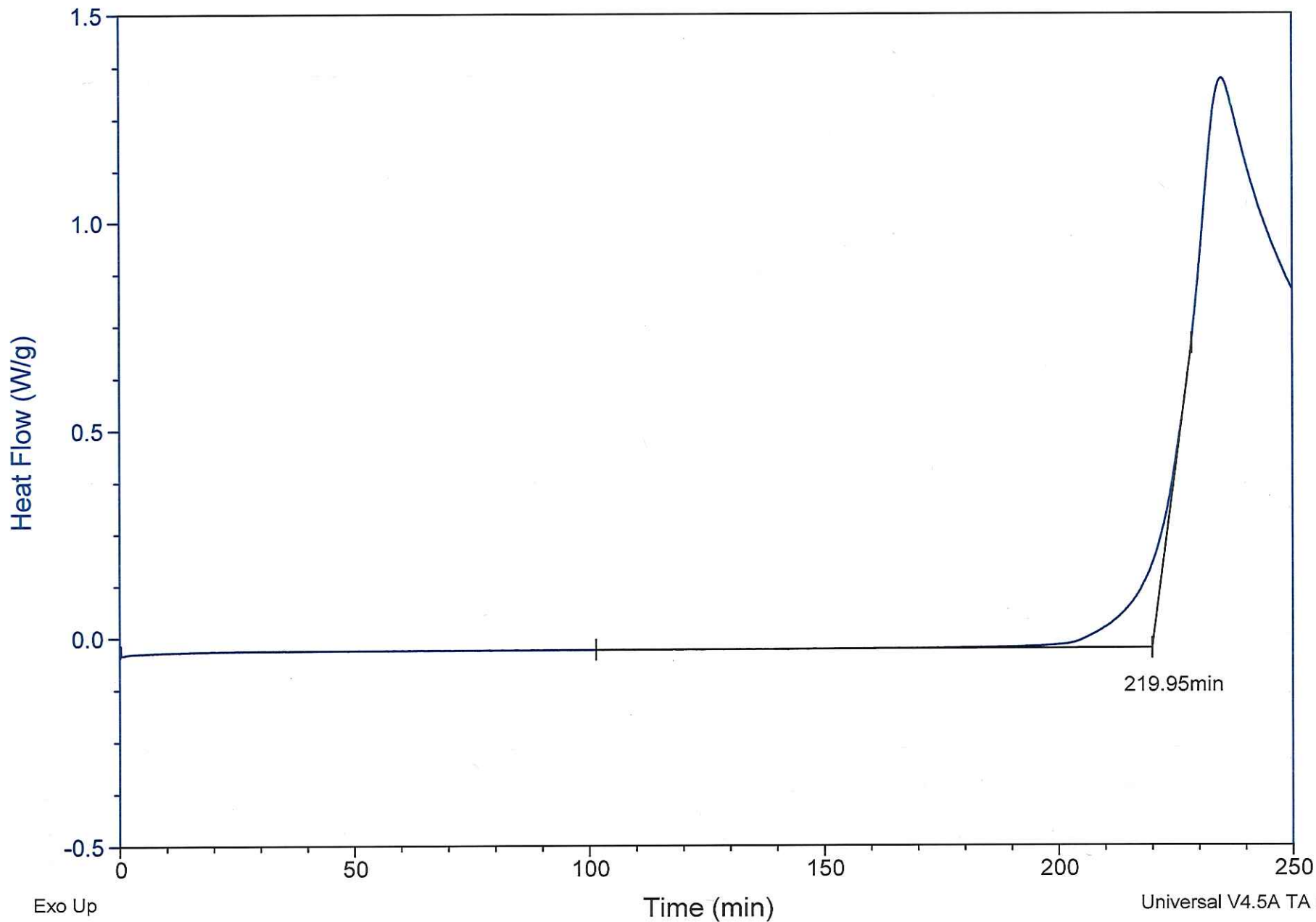
**\*\*For any information concerning this report, please contact Eric Blond\*\***

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Sample: G1 Roll 5-27654  
Size: 5.1600 mg  
Method: OIT  
Comment: (S078-87-95377)

# DSC

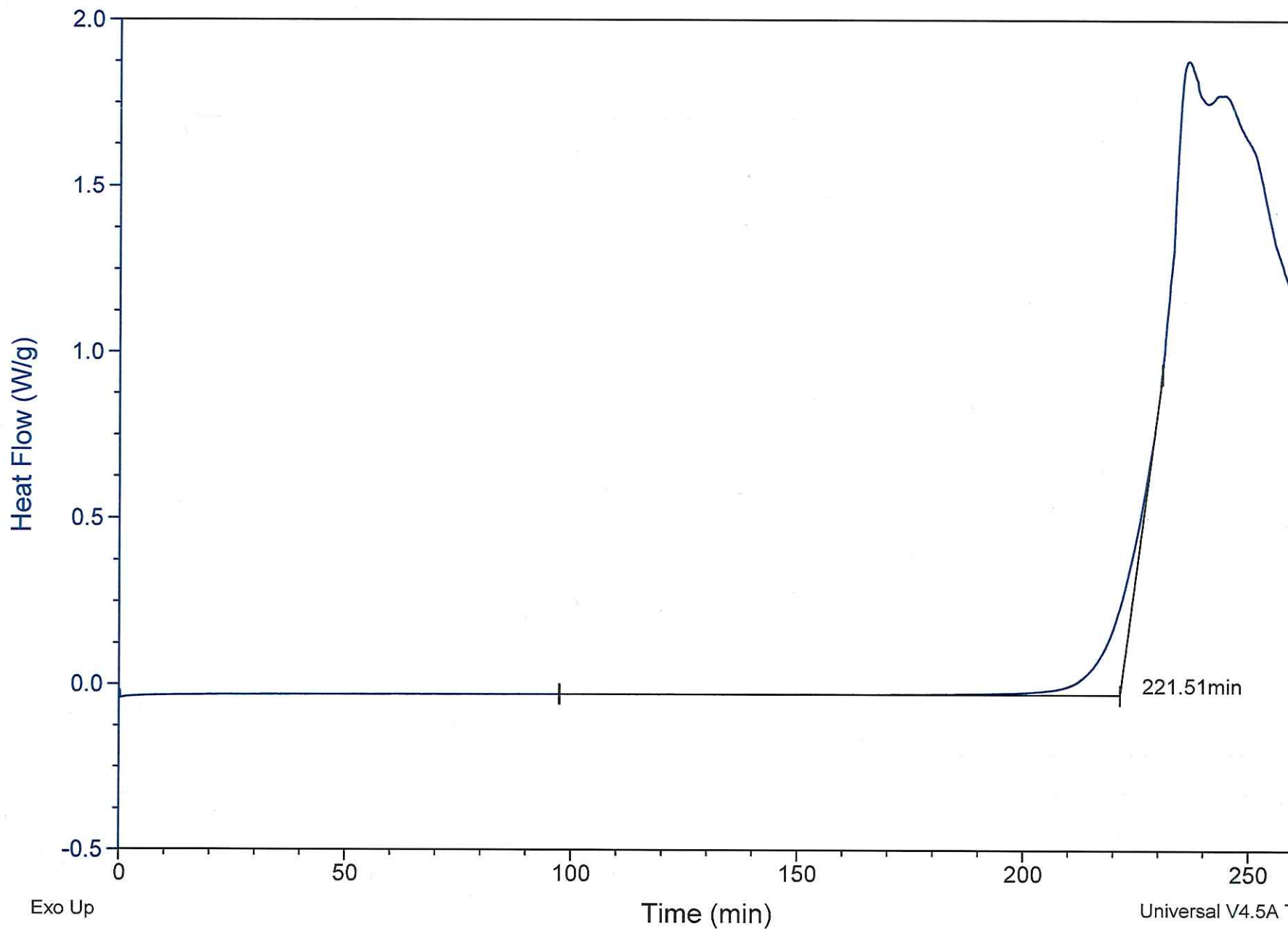
File: C:\...\S078-87\G1 Roll 5-27654.001  
Operator: Karine Tourchot  
Run Date: 31-Mar-2017 00:13  
Instrument: DSC Q100 V9.9 Build 303



Sample: G1 Roll 5-27654  
Size: 5.3600 mg  
Method: OIT  
Comment: (S078-87-95377)

# DSC

File: C:\...\S078-87\G1 Roll 5-27654.002  
Operator: Karine Tourchot  
Run Date: 31-Mar-2017 13:05  
Instrument: DSC Q100 V9.9 Build 303

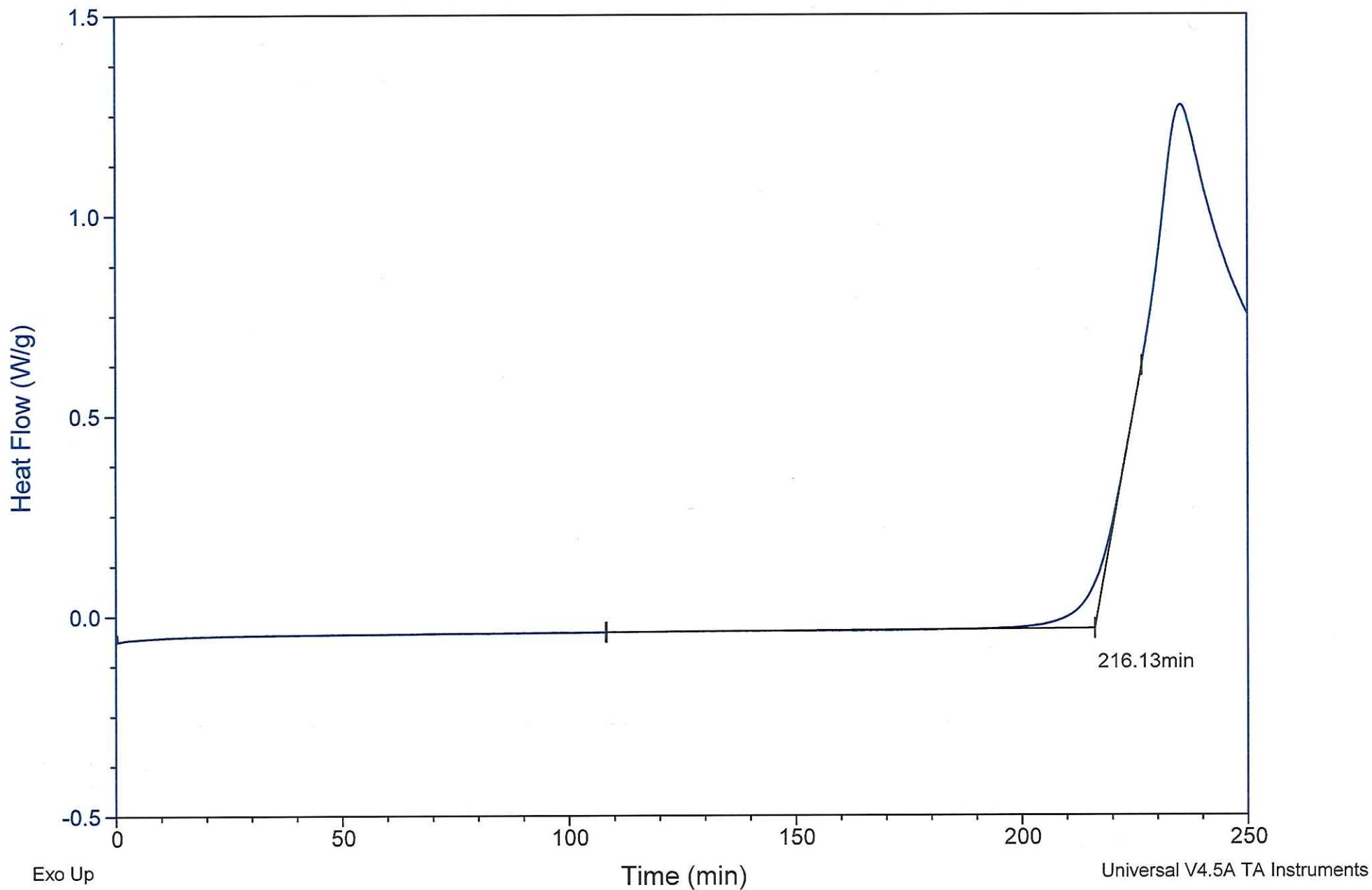




Sample: G2 Roll 5-27659  
Size: 5.0000 mg  
Method: OIT  
Comment: (S078-87-95377)

# DSC

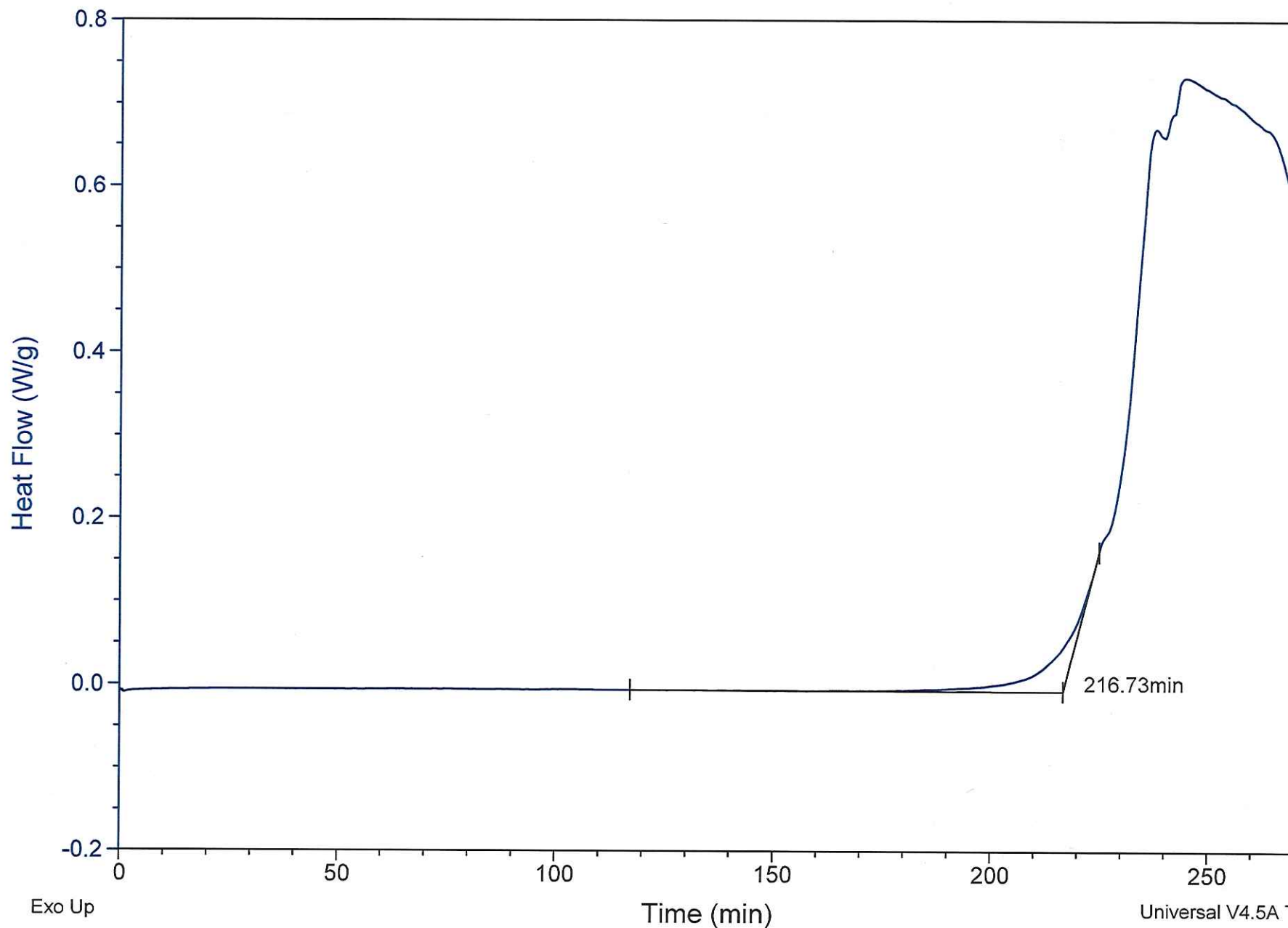
File: C:\...\S078-87\G2 Roll 5-27659.001  
Operator: Karine Tourchot  
Run Date: 30-Mar-2017 11:49  
Instrument: DSC Q100 V9.9 Build 303



Sample: G2 Roll 5-27659  
Size: 5.3800 mg  
Method: OIT  
Comment: (S078-87-95377)

# DSC

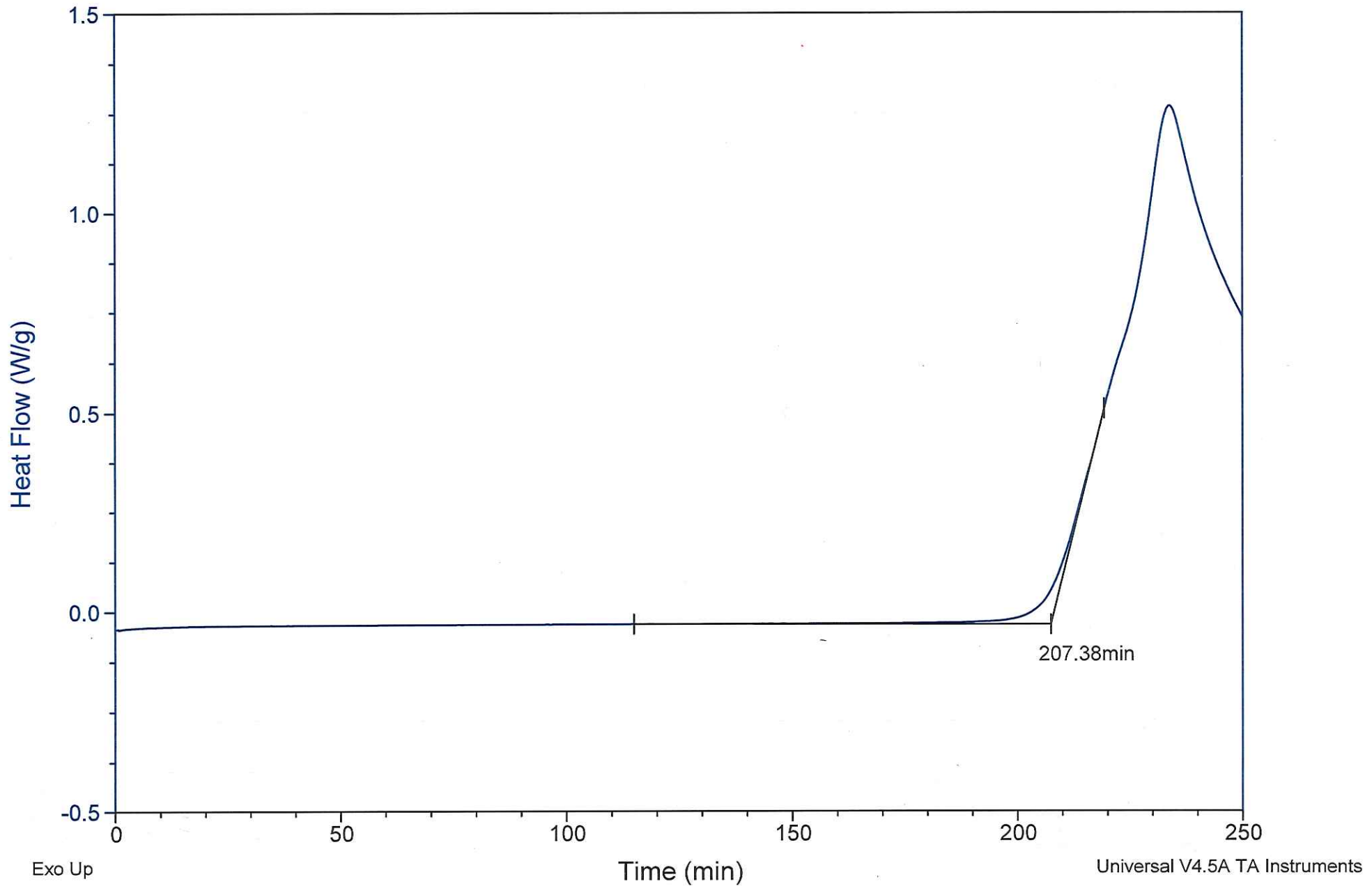
File: C:\...\S078-87\G2 Roll 5-27659.002  
Operator: Karine Tourchot  
Run Date: 31-Mar-2017 06:25  
Instrument: DSC Q100 V9.9 Build 303



Sample: G3 Roll 5-27656  
Size: 5.0000 mg  
Method: OIT  
Comment: (S078-87-95377)

# DSC

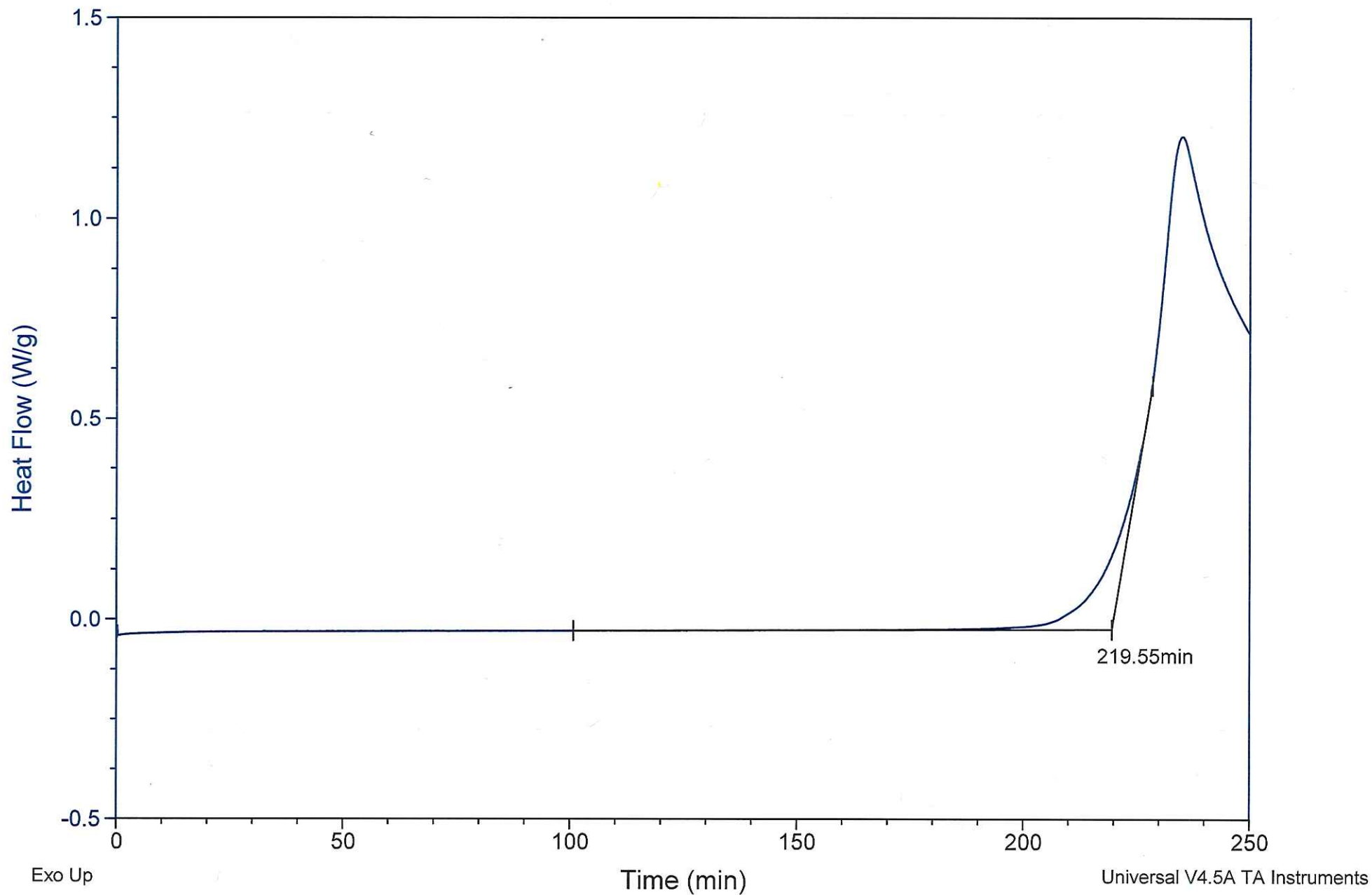
File: C:\...\S078-87\G3 Roll 5-27656.001  
Operator: Karine Tourchot  
Run Date: 30-Mar-2017 18:01  
Instrument: DSC Q100 V9.9 Build 303



Sample: G3 Roll 5-27656  
Size: 5.1600 mg  
Method: OIT  
Comment: (S078-87-95377)

# DSC

File: C:\...\S078-87\G3 Roll 5-27656.003  
Operator: Karine Tourchot  
Run Date: 31-Mar-2017 18:02  
Instrument: DSC Q100 V9.9 Build 303



**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: July 6, 2017  
 Report: S078-087-95378A

**IDENTIFICATION:** Geomembrane aging: G-1 Roll 5-27654  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**


**TEST:** Air Oven Aging of Polyolefin Geomembranes ASTM D5721-08(2013)

**TEST CONDITIONS:** AIR-OVEN AGING:  
 . Rotation of the exposed specimens: once per week; Apparatus used: Force-ventilation oven "Blue M";  
 . Temperature ( C): 85  
 . Beginning of exposure: April 3, 2017  
 . End of exposure: July 3, 2017  
 HP-OIT as per ASTM D5885 ;  
 . Sample blended by "two-roll milling" at 150 C for 2 1/2 minutes ;  
 . Test specimens prepared as per ASTM D4703 (molding by compression to a thickness of 0.25 mm) ;  
 . Apparatus used: DSC Q20 Differential Scanning Calorimeter TA Instrument ;  
 . Type of cup: aluminium; Temperature: 150 C; Pressure 500 psi ;  
 . Tested between March 31 and July 5, 2017

RESULTS:	Individual Data			Avg.	S.D.	% CV
VISIBLE CHANGES - AFTER 90 DAYS (yes/no):	no					
HP OIT - INITIAL	...					
. Mass of the test specimen (mg):	5.46					
. HP OIT (min):	1527					
HP OIT - AFTER 90 DAYS	...					
. Mass of the test specimen (mg):	4.97	5.31	5.04	<b>5.11</b>	0.18	<b>3.5</b>
. HP OIT (min):	1111	1220	1196	<b>1 176</b>	57	<b>4.9</b>
. Retained value (%):	77.0					

**REMARKS:** See graphs in appendix.

Prepared by:

  
 Karine Tourchot,  
 Technician

Approved by:

Sylvie Dalp   
  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: July 6, 2017

**\*\*For any information concerning this report, please contact Eric Blond\*\***

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**ANALYSIS REPORT**  
**SCC Accreditation No.: 40‡**

Mr Greig Graham  
**Terrafix Geosynthetics Inc.**

Date: July 6, 2017  
 Report: S078-087-95378A

**IDENTIFICATION:** Geomembrane aging: G-1 Roll 5-27654  
 Project: Terrapure Stoney Creek Landfill, Phase 8 Base Liner and Leachate Collection System  
 Received: March 28, 2017; PO#: CL1629GG006

**STANDARD:**


**TEST:** Effect of Exposure of Unreinforced Polyolefin Geomembrane Using Fluorescent UV Condensation Apparatus ASTM D7238-06(2012)

**TEST CONDITIONS:** UVA AGING:  
 . Apparatus used: Q-PANEL QUV/spray; Lamp: UVA-340;  
 . Irradiation: 0.78 W/m<sup>2</sup>/nm @ 340 nm;  
 . Duration of the test: 1600 hours of UV exposure (total of 1920h) ;  
 . Cycle: 20h of light at 75°C + 4h of condensation at 60°C ;  
 . Beginning of exposure: April 3, 2017  
 . End of exposure: June 26, 2017  
 HP-OIT as per ASTM D5885 ;  
 . Test specimens prepared as per ASTM D4703 (molding by compression to a thickness of 0.25 mm) ;  
 . Apparatus used: DSC Q20 Differential Scanning Calorimeter TA Instrument ;  
 . Type of cup: aluminium ;  
 . Temperature: 150°C; Pressure 500 psi ;  
 . Sample blended by "two-roll milling" at 150°C for 2 1/2 minutes ;  
 . Tested between March 31 and June 29, 2017

RESULTS:	Individual Data			Avg.	S.D.	% CV
HP OIT - INITIAL	...					
. Mass of the test specimen (mg):	5.46					
. HP OIT (min):	1527					
HP OIT - AFTER 1600h of UV	...					
. Mass of the test specimen (mg):	5.25	5.61	5.32	<b>5.39</b>	0.19	<b>3.5</b>
. HP OIT (min):	1285	1308	1340	<b>1 311</b>	28	<b>2.1</b>
. Retained value (%):	85.9					

**REMARKS:** See graphs in appendix.

Prepared by:

  
 Karine Tourchot,  
 Technician

Approved by: Sylvie Dalpé

  
 For: Eric Blond, Eng., M.Sc.A.  
 Vice-President

Date: July 6, 2017

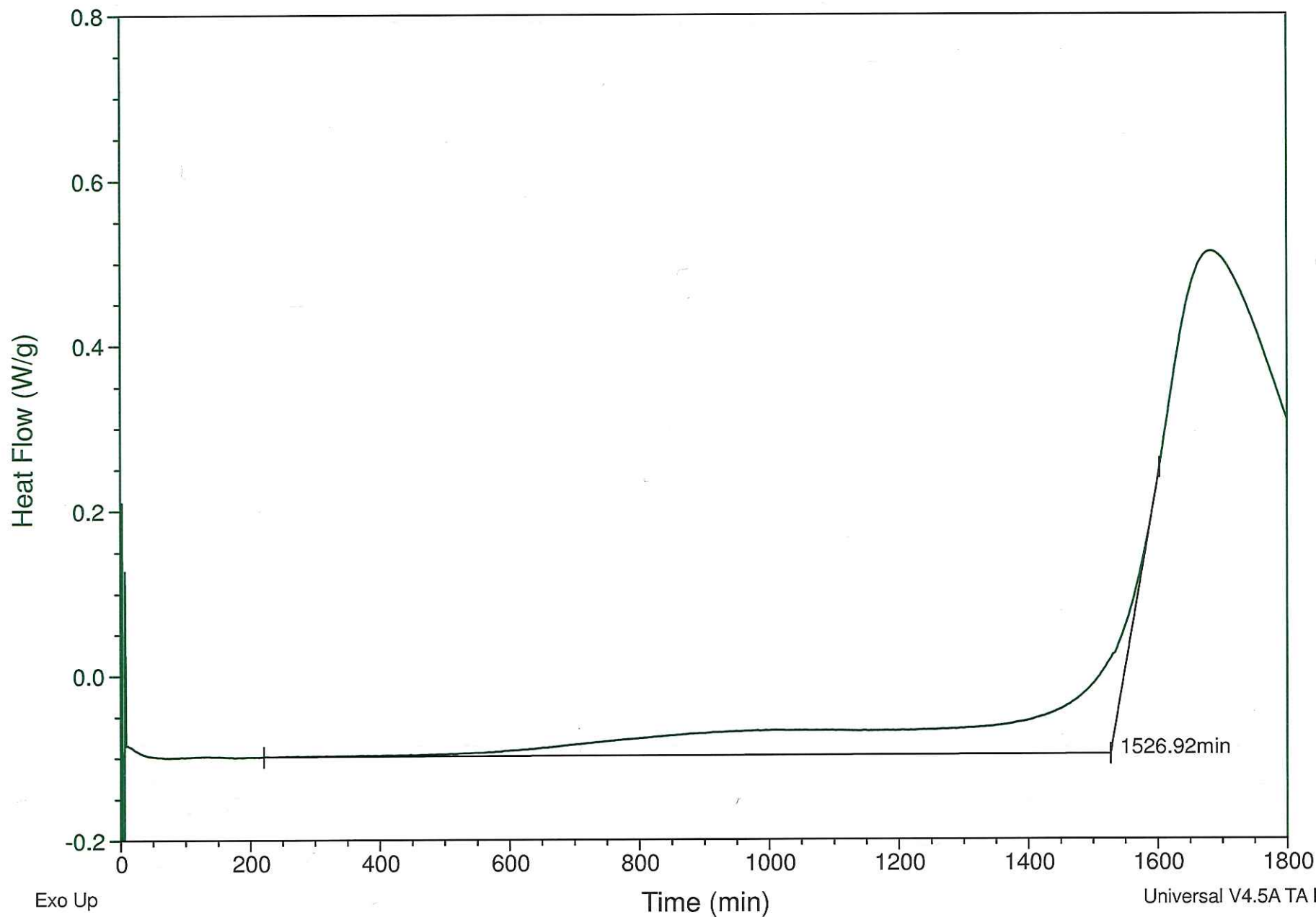
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Sample: G1 Roll 5-27654  
Size: 5.4600 mg  
Method: HP Oxygen induction time  
Comment: (S078-87-95378)

# DSC

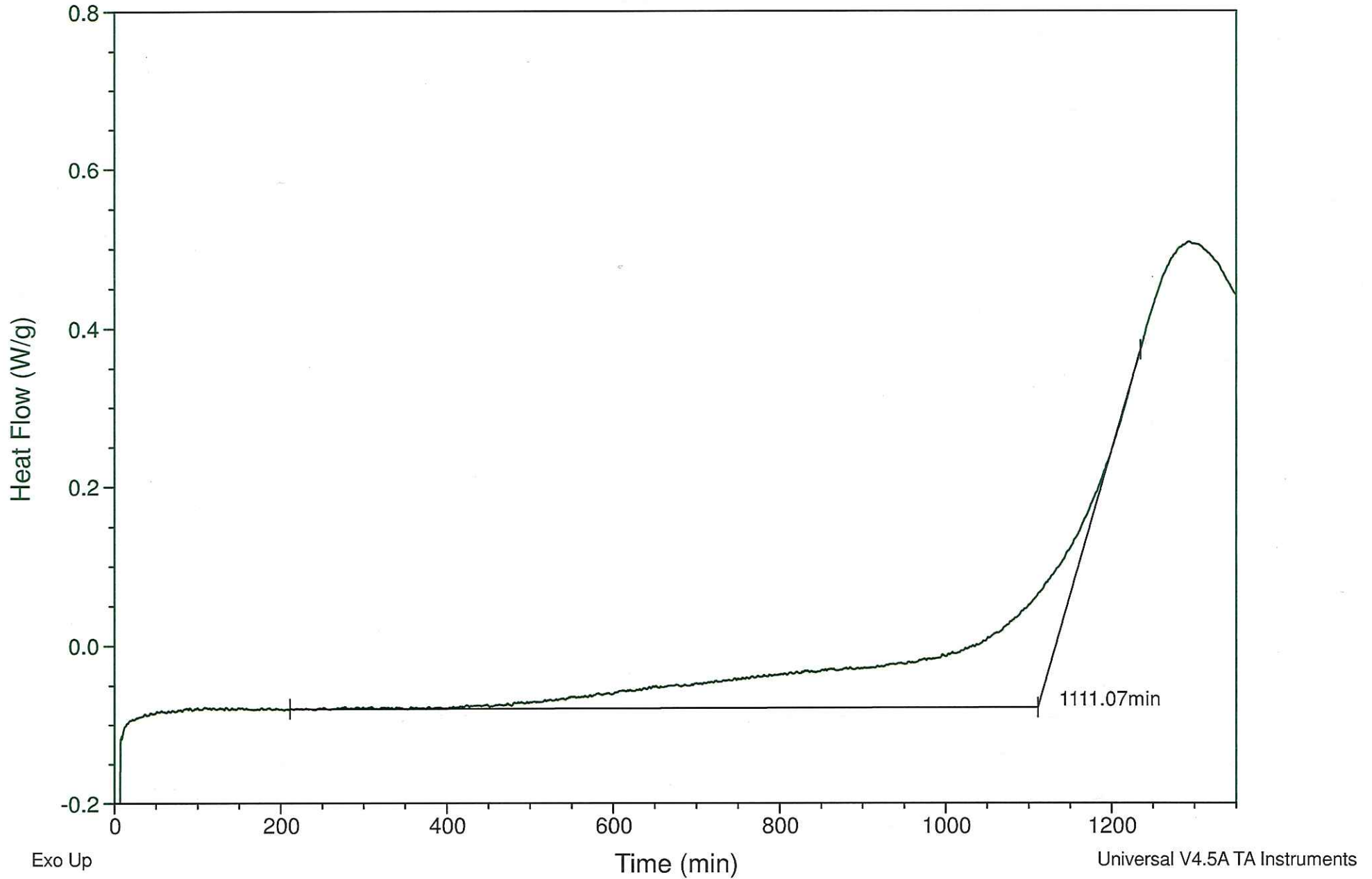
File: C:\S078-87\G1 Roll 5-27654 HP.003  
Operator: Karine Tourchot  
Run Date: 31-Mar-2017 14:36  
Instrument: DSC Q20P V24.11 Build 124



Sample: G1 Roll 5-27654 after 90 days  
Size: 4.9700 mg  
Method: HP Oxygen induction time  
Comment: (S078-087-95378)

# DSC

File: ...G1 Roll 5-27654 after 90 days HP.001  
Operator: Karine Tourchot  
Run Date: 03-Jul-2017 10:30  
Instrument: DSC Q20P V24.11 Build 124

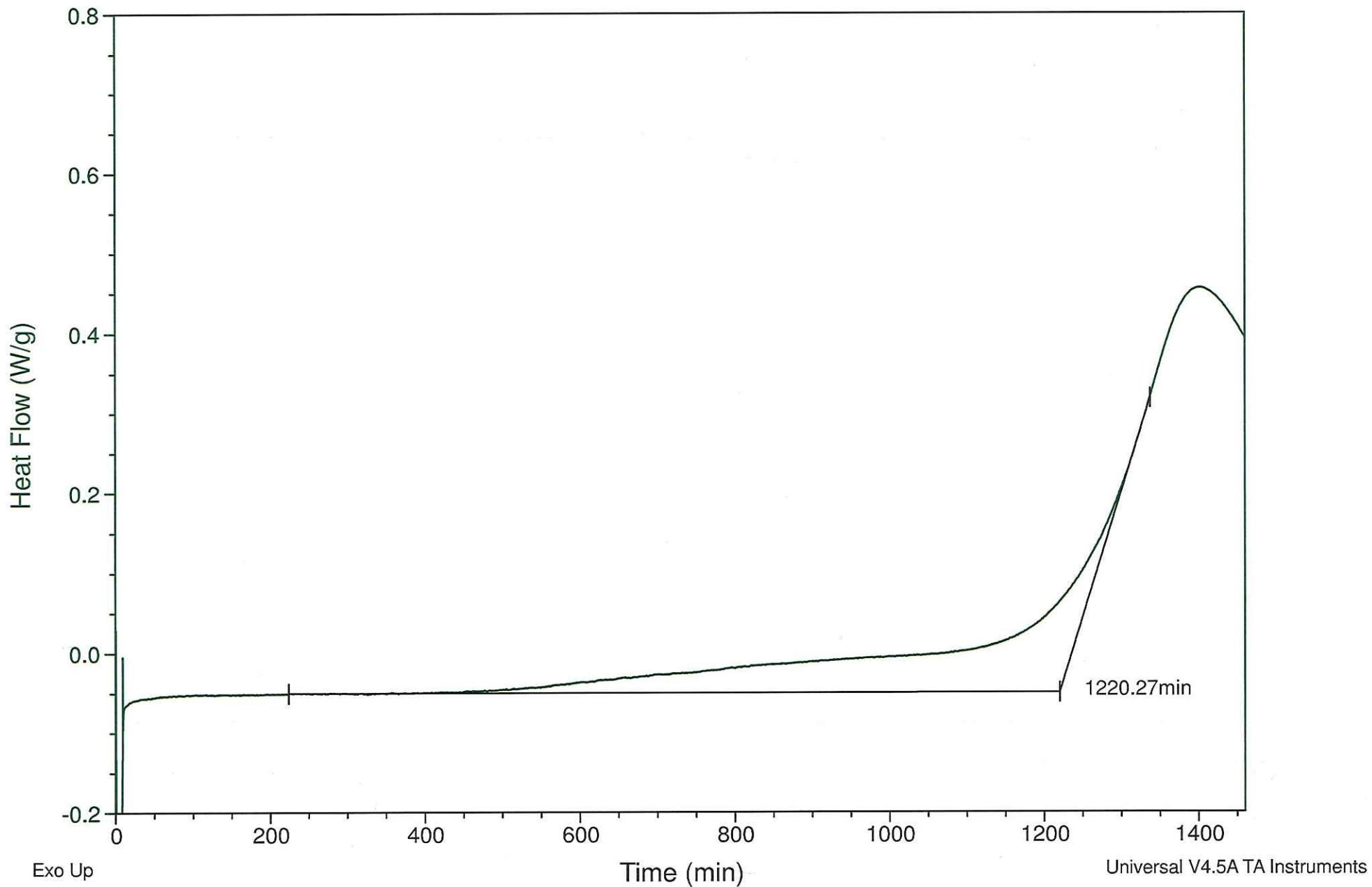




Sample: G1 Roll 5-27654 after 90 days  
Size: 5.3100 mg  
Method: HP Oxygen induction time  
Comment: (S078-087-95378)

# DSC

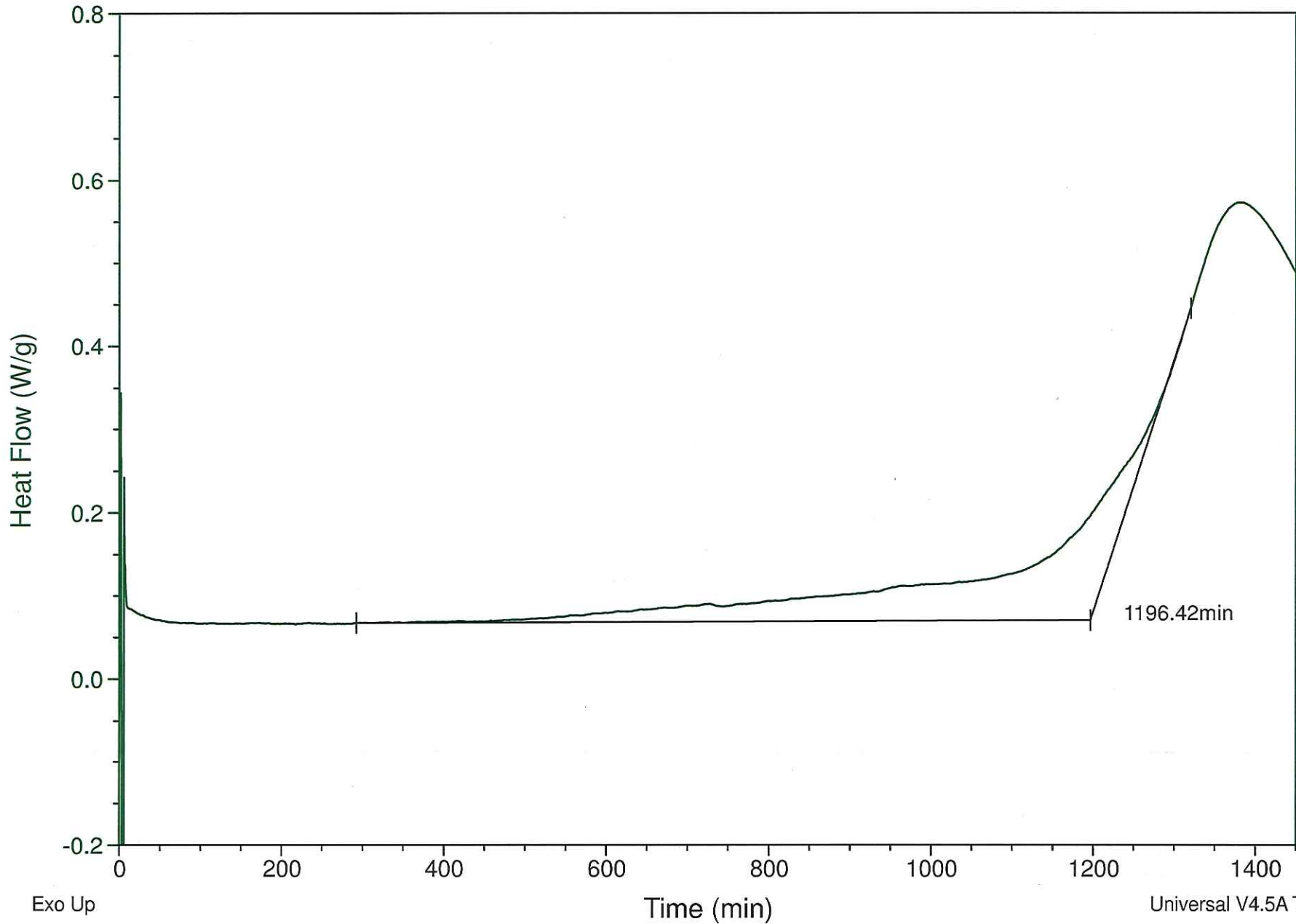
File: ...G1 Roll 5-27654 after 90 days HP.002  
Operator: Karine Tourchot  
Run Date: 04-Jul-2017 09:52  
Instrument: DSC Q20P V24.11 Build 124



Sample: G1 Roll 5-27654 after 90 days  
Size: 5.0400 mg  
Method: HP Oxygen induction time  
Comment: (S078-087-95378)

# DSC

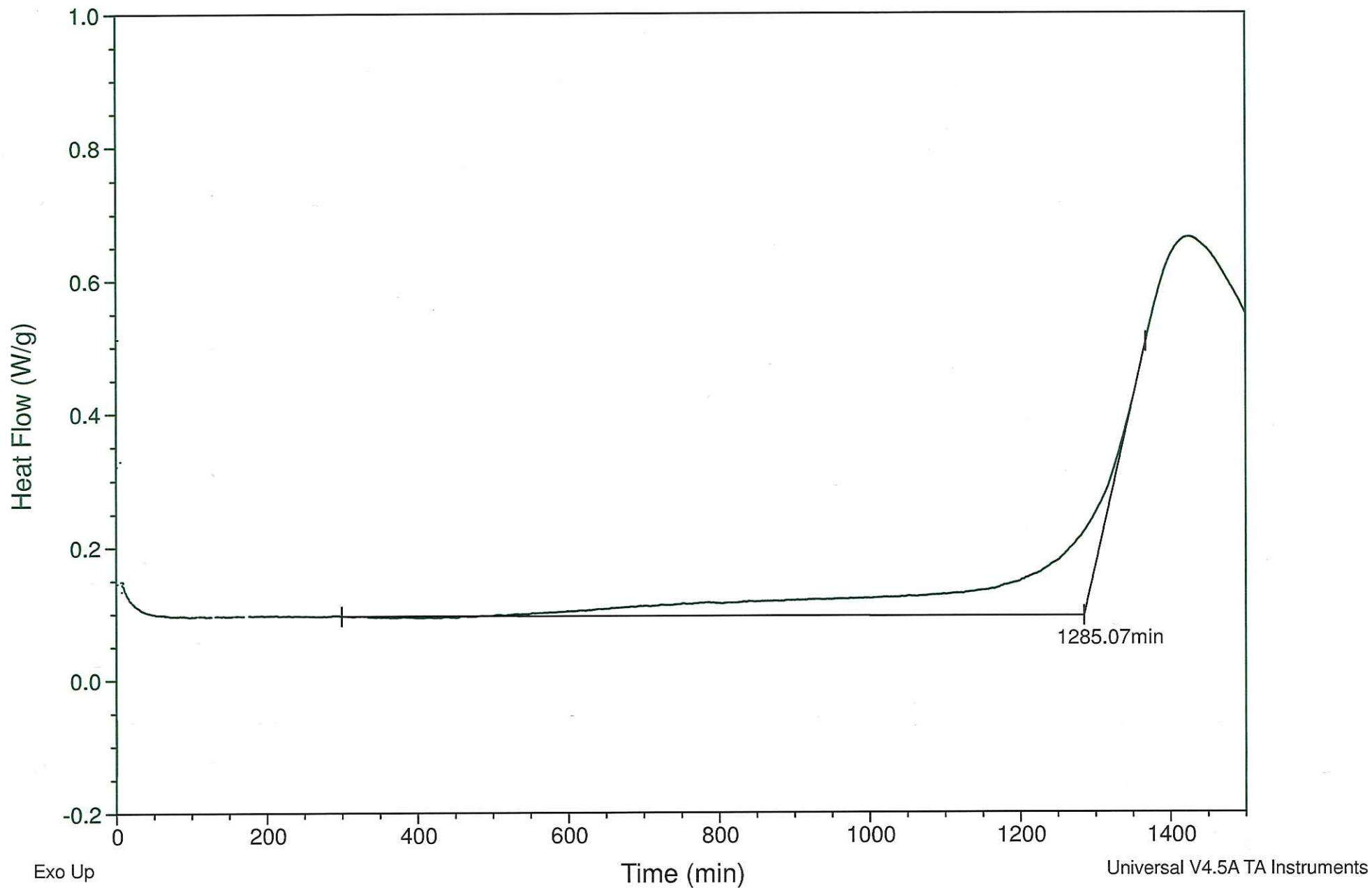
File: ...G1 Roll 5-27654 after 90 days HP.003  
Operator: Karine Tourchot  
Run Date: 05-Jul-2017 11:26  
Instrument: DSC Q20P V24.11 Build 124



Sample: G1 Roll 5-27654 after 1600H  
Size: 5.2500 mg  
Method: HP Oxygen induction time  
Comment: (S078-087-95378)

# DSC

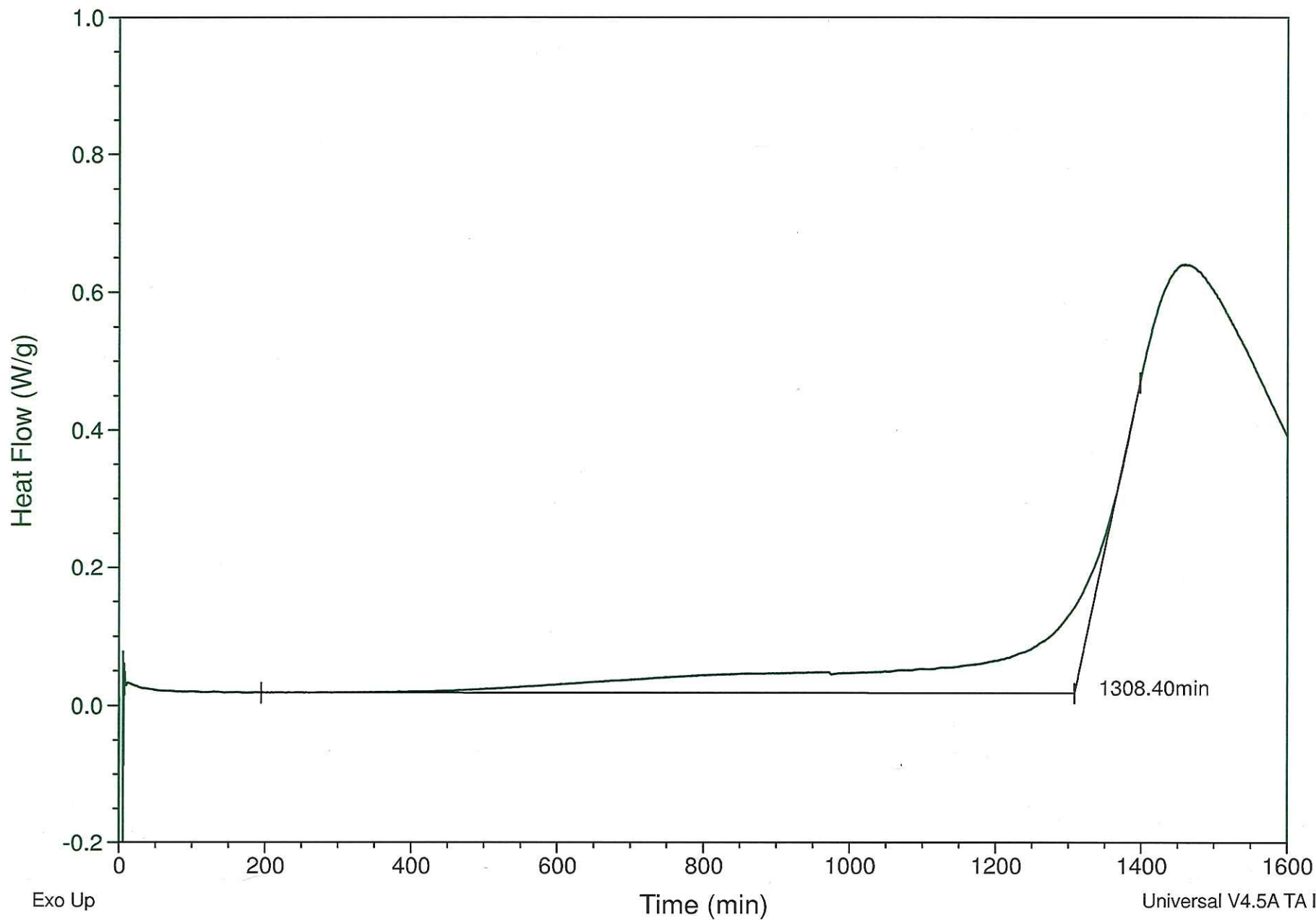
File: C:\...\G1 Roll 5-27654 after 1600H HP.001  
Operator: Karine Tourchot  
Run Date: 26-Jun-2017 11:29  
Instrument: DSC Q20P V24.11 Build 124



Sample: G1 Roll 5-27654 after 1600H  
Size: 5.6100 mg  
Method: HP Oxygen induction time  
Comment: (S078-087-95378)

# DSC

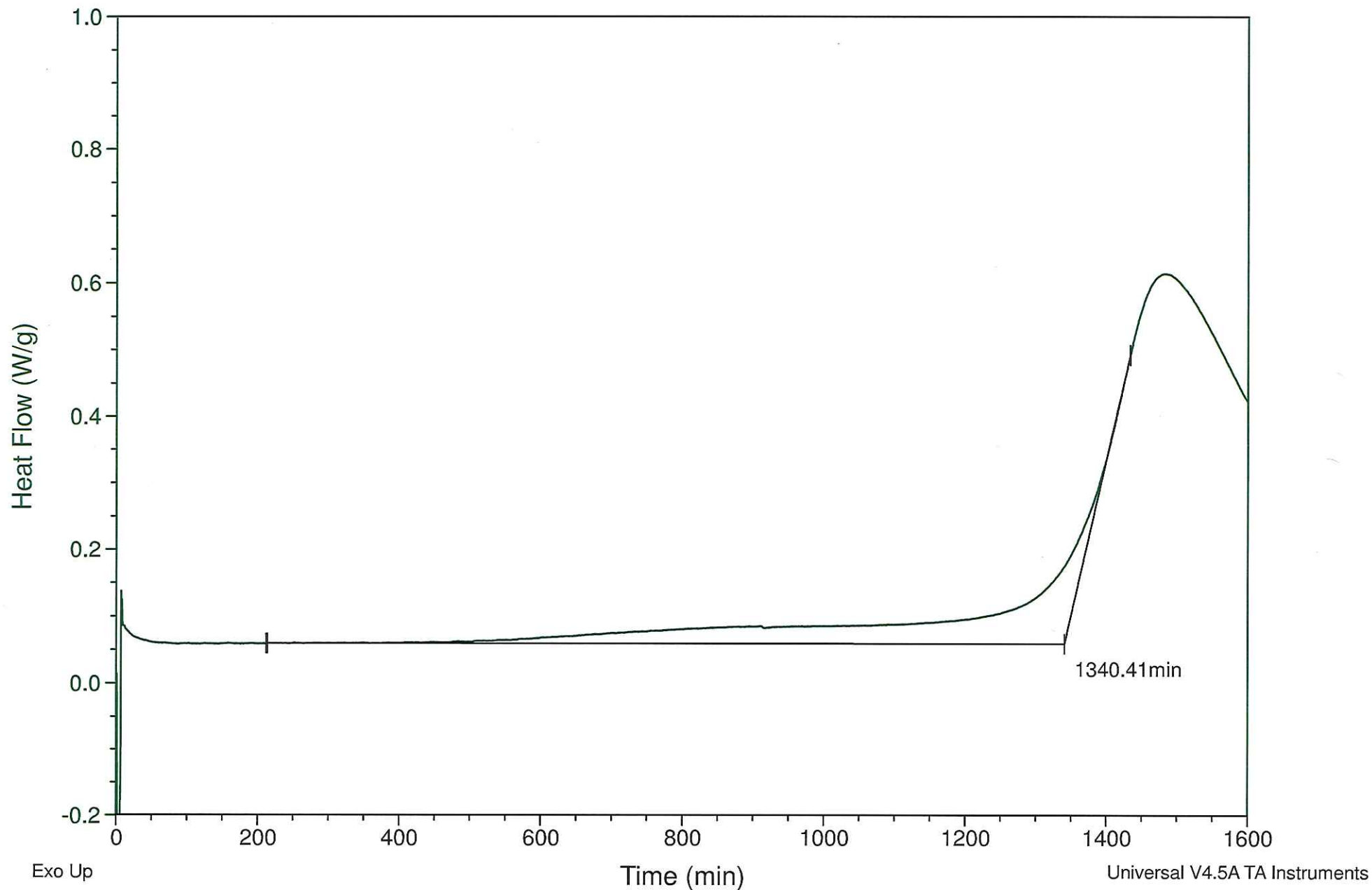
File: C:\...\G1 Roll 5-27654 after 1600H HP.002  
Operator: Karine Tourchot  
Run Date: 27-Jun-2017 13:46  
Instrument: DSC Q20P V24.11 Build 124



Sample: G1 Roll 5-27654 after 1600H  
Size: 5.3200 mg  
Method: HP Oxygen induction time  
Comment: (S078-087-95378)

# DSC

File: C:\...\G1 Roll 5-27654 after 1600H HP.003  
Operator: Karine Tourchot  
Run Date: 29-Jun-2017 09:05  
Instrument: DSC Q20P V24.11 Build 124



## Appendix E2.1 Letter from the Manufacturer



PROPERTY	TEST METHOD	FREQUENCY <sup>(1)</sup>	UNIT Metric	1030510
<b>SPECIFICATIONS</b>				
Nominal Thickness	-	-	mm	2.00
Thickness (min. avg.)	ASTM D-5994	Every roll	mm	2.00
Lowest ind. for 10 out of 10 values			mm	1.80
Asperity Height (min. avg.) (3)	ASTM D-7466	Every roll	mm	0.40
Resin Density	ASTM D-1505	1/Batch	g/cc	> 0.932
Melt Index - 190/2.16 (max.)	ASTM D-1238	1/Batch	g/10 min	1.0
Sheet Density (8)	ASTM D-792	Every 10 rolls	g/cc	≥ 0.940
Carbon Black Content (9)	ASTM D-4218	Every 2 rolls	%	2.0 - 3.0
Carbon Black Dispersion	ASTM D-5596	Every 10 rolls	Category	Cat. 1 / Cat. 2
OIT - standard (avg.)	ASTM D-3895	1/Batch	min	100
Tensile Properties (min. avg.) (2)	ASTM D-6693	Every 2 rolls		
Strength at Yield			kN/m	31
Elongation at Yield			%	13
Strength at Break			kN/m	31
Elongation at Break			%	150
Tear Resistance (min. avg.)	ASTM D-1004	Every 5 rolls	N	265
Puncture Resistance (min. avg.)	ASTM D-4833	Every 5 rolls	N	675
Dimensional Stability	ASTM D-1204	Certified	%	± 2
Stress Crack Resistance (SP-NCTL)	ASTM D-5397	1/Batch	hr	500
Oven Aging - % retained after 90 days	ASTM D-5721	Per formulation (5)		
HP OIT (min. avg.)	ASTM D-5885		%	80
UV Resistance - % retained after 1600 hr	GRI-GM-11	Per formulation (5)		
HP-OIT (min. avg.)	ASTM D-5885		%	50
<b>SUPPLY SPECIFICATIONS</b> (Roll dimensions may vary ±1%)				
Roll Dimension - Width	-		m	6.80
Roll Dimension - Length	-		m	128.0
Area (Surface/Roll)	-		m <sup>2</sup>	870.4
Color (one side) (4)	-	-		White



## NOTES

1. Testing frequency based on standard roll dimensions and one batch is approximately 180,000 lbs (or one railcar).
2. Machine Direction (MD) and Cross Machine Direction (XMD or TD) average values should be on the basis of 5 specimens each direction.
3. Lowest individual and 8 out of 10 readings as per GRI-GM13 / 17, latest version.
4. Black or grey spots may be visible on the textured surface. Smooth edge may not have the same consistent shade of color as the membrane itself. The colored layer may cause the carbon black content results to be higher than 3%.
5. Certified by core (black) formulation on geomembrane roll or molded plaque.
8. Correlation table is available for ASTM D792 vs ASTM D1505. Both methods give the same results.
9. Correlation table is available for ASTM D1603 vs ASTM D4218. Both methods give the same results.

\* All values are nominal test results, except when specified as minimum or maximum.

\* The information contained herein is provided for reference purposes only and is not intended as a warranty of guarantee. Final determination of suitability for use contemplated is the sole responsibility of the user. SOLMAX assumes no liability in connection with the use of this information.

Solmax is not a design professional and has not performed any design services to determine if Solmax's goods comply with any project plans or specifications, or with the application or use of Solmax's goods to any particular system, project, purpose, installation or specification.

**Identification:**

Type of Material :	<b>HDPE</b>	Formulation :	<b>HD27-13</b>
Roll Number:	<b>2-80555</b>	Resin Type :	<b>Formosa HL3812</b>
Production Date :	<b>2015-05-01</b>	Lot Number :	<b>15C1219</b>

**Oxidative Induction Time (ASTM D3895)**

	Individual Data			Avg.	S.D.	% CV
OIT (minutes)	210	217		214	5	2.4

**High Pressure Oxidative Induction Time (ASTM D5885)**

	Individual Data			Avg.	S.D.	% CV
HP OIT (minutes)	1816	1693		1754	87	5.0

**UV Resistance (ASTM D7238)**

- The resistance to degradation was determined in accordance with ASTM D7238 ;
- Apparatus used : Q-PANEL QUV/se - Lamp: UVA-340;
- Duration of the test: 1600 hours of UV exposure (total of 1920h);
- Cycle : 80 cycles of UVA (20h of light at 75°C followed by 4h of condensation at 60°C)

	Individual Data			Avg.	S.D.	% CV
HP OIT (minutes) : ASTM D5885 - Initial	1816	1693		1754	87	5.0
HP OIT (minutes) : ASTM D5885 - After 1600h of UV	1489	1639		1564	106	6.8
<b>PERCENTAGE RETAINED:</b>	<b>89 %</b>			Note: No visual change after 1600 hrs		

**Air-Oven Aging (ASTM D5721)**

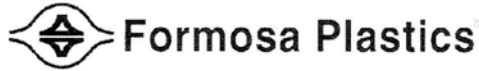
- The resistance to degradation was determined in accordance with ASTM D5721;
- Duration of the test: The geomembrane was exposed to 90 days in an air oven maintained at 85°C ± 0.5°C;
- Rotation of the exposed specimens : once per wee

	Individual Data			Avg.	S.D.	% CV
OIT (minutes) : ASTM D3895 - Initial	210	217		214	5	2.4
OIT (minutes) : ASTM D3895 - After 90 days of Oven Aging	104	107		105	2	1.5
<b>PERCENTAGE RETAINED:</b>	<b>49 %</b>					

	Individual Data			Avg.	S.D.	% CV
HP OIT (minutes) : ASTM D5885 - Initial	1816	1693		1754	87	5.0
HP OIT (minutes) : ASTM D5885 - After 90 days of Oven Aging	1398	1447		1422	34	2.4
<b>PERCENTAGE RETAINED:</b>	<b>81 %</b>			Note: No visual change after 90 days		

The tests were performed by Solmax International. The laboratories of Solmax International are accredited by the GRI.

**Simon Gilbert St-Pierre, Eng.**  
 Technical Services



FORMOSA PLASTICS CORPORATION, TEXAS

201 FORMOSA DRIVE  
PO BOX 700  
POINT COMFORT

TX 77978

PHONE: ( 888 ) FPCUSA3

Certificate of Analysis

CUSTOMER: SOLMAX INTERNATIONAL INC.  
2801 MARIE-VICTORIN

S/O NO : EQ4A049  
CUSTOMER PO : 113063-0  
DATE SHIPPED: 4/15/15  
LOT NO : 15C1219  
WEIGHT (LB) : 192,200.00  
CUSTID: FT03828 SPIDE3

VARENNES QC J3X 1  
PRODUCT : HL3812  
RAILCAR UTCX059390

Property	Method	Spec Min	Actual	Spec Max
Melt Index, g/10min	ASTM D1238	.04	.070	.12
HLMI, g/10 min.	ASTM D1238	9	12.5	13
Density, g/cm3	ASTM D1505	.935	.9366	.939

Notes:

- \* Additive levels were tested and meet the min specification for this lot
- \* t. As a result Standard OIT (by ASTM D3895) is greater than 120 mins (nominal values not tested on every lot).
- \* As a result, High Pressure OIT (by ASTM D5885) is greater than 1000 mins.

*Linda Kas*

QC SUPERVISOR



# SOLMAX

# QUALITY CONTROL REPORT

Roll Certification

Solmax, 2801 Boul. Marie-Victorin, Varennes, Qc, Canada, J3X 1P7  
Tél.: 1-450-929-1234 • Fax.: 1-450-929-2547 • www.solmax.com

## ROLL IDENTIFICATION

Roll Number : **2-80555**

Product Code : Solmax 480-2071

Production Date 2015-05-01

## RESIN INFORMATION

Resine Lot Number 15C1219

Resine Type : HDPE / HL3812

Resine Supplier : Formosa

Property		Test Method	Test Frequency	Technical Data Metric	Test Results Metric
Length (± 1%) :	121.9 meters	Density (g/cc)	ASTM D 1505	0.937	
Width :	6.80 meters	Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.07	
Sheet Area :	829 sq. meters	ESCR (hrs)	ASTM D 5397	>400	
Weight :	1 623 kilograms	OIT (min.)	ASTM D 3895	120	
		HP-OIT (min.)	ASTM D 5885		
Physical Property		Test Method	Test Frequency	Technical Data Metric	Test Results Metric
Thickness (mm)	Average	ASTM D-5199	1/1 ro	2.03	2.03
	Minimum			1.83	2.01
Asperity (mm)	Average (out / in )	N/A	N/A		/
Tensile properties		ASTM D-6693	1/2 ro		
Yield strength (kN/m)	TD			31	31.9
	MD			33.2	
Yield elongation (%)	TD			13	18.4
	MD			18.3	
Break strength (kN/m)	TD			57	70.3
	MD			71.7	
Break elongation (%)	TD			700	883
	MD			848	
Tear Resistance (N)	TD	ASTM D-1004	1/6 ro	250	291
	MD			272	
Puncture Resistance (N)		ASTM D-4833	1/6 ro	695	764
Density (g/cc)		ASTM D-1505	1/2 ro	≥ 0.940	0.946
Carbon Black Content (%)		ASTM D-4218	1/2 ro	2.0 - 3.0	2.56
Carbon Black Dispersion		ASTM D-5596	1/6 ro	Cat. 1 & Cat. 2	10
Dimensional Stability (%)	TD	ASTM D-1204	1/6 ro	± 2	0.01
	MD				-0.30

## GEOMEMBRANE CERTIFICATION

Physical Property	Test Method	Test Frequency	Test Result
Oven Aging - % retained after 90 days	ASTM D-5721	1/Form	
HP OIT (min. avg.)	ASTM D-5885		> 80
UV Resistance - % retained after 1600 hr	GRI-GM-11	1/Form	
HP-OIT (min. avg.)	ASTM D-5885		> 50





2801, BOUL. MARIE-VICTORIN,  
VARENNES (QC) CANADA J3X 1P7  
450.929.1234  
[SOLMAX.COM](http://SOLMAX.COM)

Covering the world. **Protecting the earth.**

---

November 9<sup>th</sup>, 2017

Mr. Greig Graham  
Terrafix Environmental Technology Inc.  
Toronto, ON

Ref. Phase 8 Base Liner and Leachate Collection System  
Terrapure Stoney Creek Landfill  
**Cold Weather Conditions for HDPE Liner Seaming**

Dear Greig,

Please accept this letter as a confirmation that Solmax accept the welding of our HDPE Geomembrane at temperature below 0 degree C according the GRI-GM9.

We hope this information will prove satisfactory.

Sincerely yours,

Paul Payeur  
Sales Manager – Americas  
**Solmax**

# Appendix F

## Laboratory Hydraulic Conductivity Test Results



**HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS (ASTM D5084)**

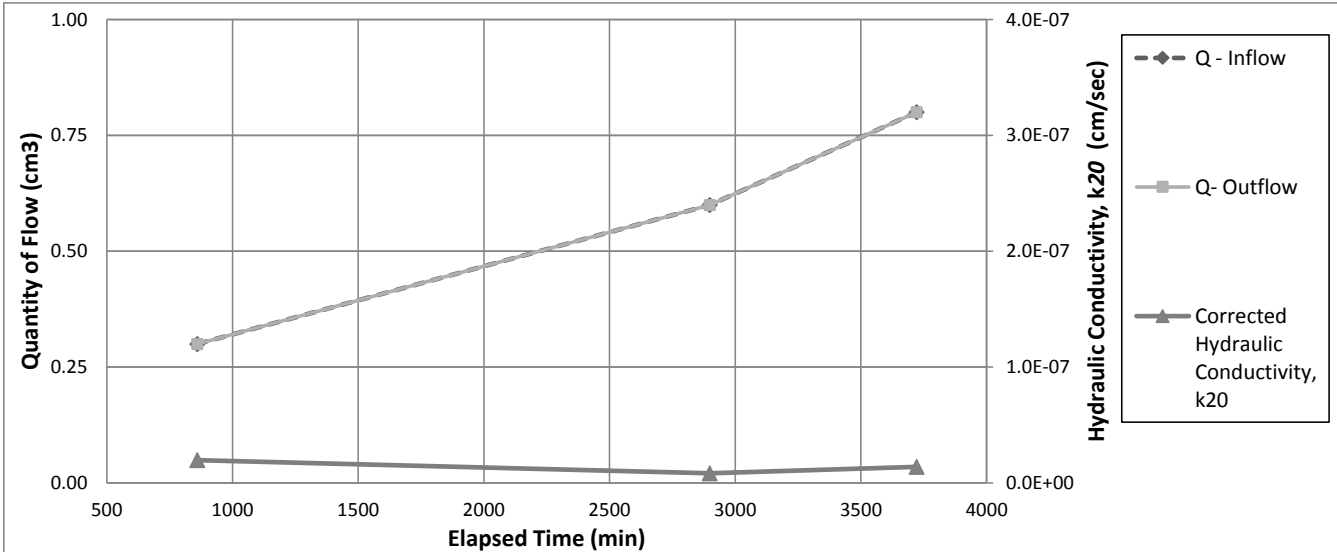
<b>CLIENT:</b>	Terrapure Environmental	<b>LAB No.:</b>	WLB-1329-1
<b>PROJECT/ SITE:</b>	Terrapure - Stoney Creek Landfill, 65 Green Mountain Road W, Hamilton	<b>PROJECT No.:</b>	11103232
<b>Sample Location:</b>	-	<b>Sampled By:</b>	Client
<b>Sample Height/Depth:</b>	-	<b>Date Sampled:</b>	-
<b>Sample Identification:</b>	1A	<b>Date Tested:</b>	Oct 4 - Oct 10, 2017

**Method C- Falling Head, Rising Tailwater Elevation**

**Sample Description:** silty CLAY, trace sand, trace gravel

Specimen Parameters	Initial	Final
Diameter, cm	3.79	
Length, cm	3.97	
Volume, cm <sup>3</sup>	44.7	
Wet Mass, g	94.6	
Dry Density, kg/m <sup>3</sup>	1786	1790
Moisture, %	18.5	19.4
Specific Gravity	2.75	
Degree of Saturation, %	94	100
Largest Particle Size, mm	4.75	

Permeation Condition	
Cell Pressure, kPa	400.1
Head Pressure, kPa	389.0
Back Pressure, kPa	379.4
B - Value	0.98
Effective Consolidation Pressure, kPa	18.70
Volume under Steady Flow, cm <sup>3</sup>	0.8
Hydraulic Gradient, <i>i</i>	24.6
<b>Hydraulic Conductivity, <i>k</i><sub>20</sub>, cm/sec</b>	<b>1.4E-08</b>



**REMARKS:** The material meets the project specifications

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<b>PERFORMED BY:</b>	Casey Adachi	<b>DATE:</b>	Oct 4 - Oct 10, 2017
<b>VERIFIED BY:</b>	Michael Braverman	<b>DATE:</b>	October 11, 2017



**HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS (ASTM D5084)**

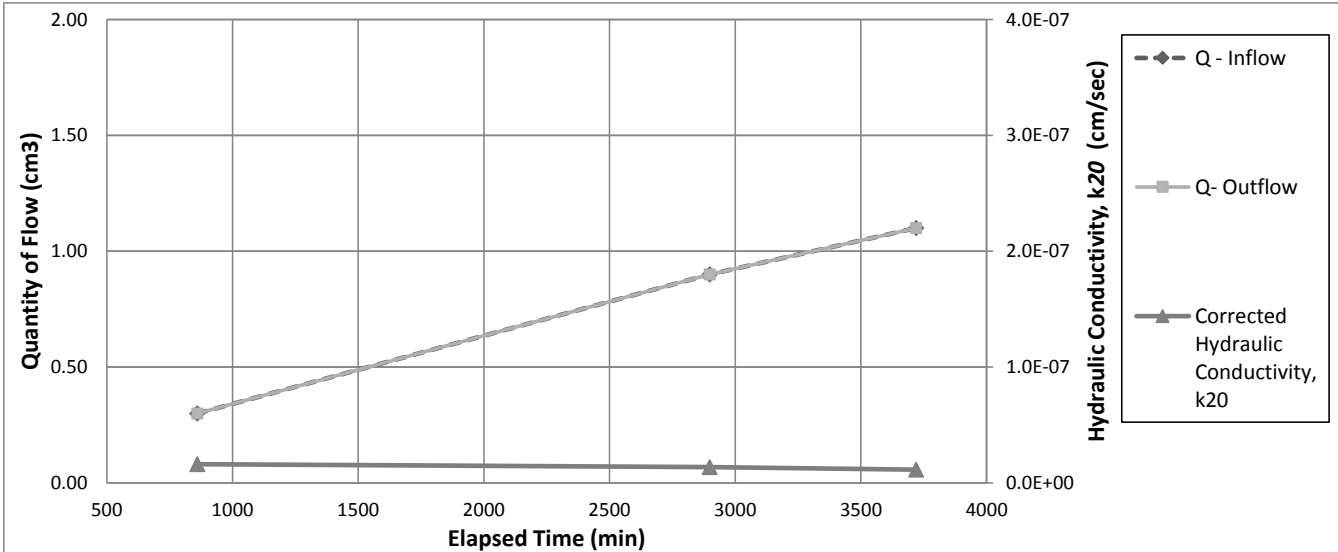
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<b>PROJECT/ SITE:</b>	Terrapure - Stoney Creek Landfill, 65 Green Mountain Road W, Hamilton	<b>PROJECT No.:</b>	11103232
<b>Sample Location:</b>	-	<b>Sampled By:</b>	Client
<b>Sample Height/Depth:</b>	-	<b>Date Sampled:</b>	-
<b>Sample Identification:</b>	2A	<b>Date Tested:</b>	Oct 4 - Oct 10, 2017

**Method C- Falling Head, Rising Tailwater Elevation**

**Sample Description:** silty CLAY, trace sand, trace gravel

Specimen Parameters	Initial	Final
Diameter, cm	3.80	
Length, cm	3.97	
Volume, cm <sup>3</sup>	45.0	
Wet Mass, g	97.0	
Dry Density, kg/m <sup>3</sup>	1820	1820
Moisture, %	18.5	18.6
Specific Gravity	2.75	
Degree of Saturation, %	99	100
Largest Particle Size, mm	4.75	

Permeation Condition	
Cell Pressure, kPa	400.1
Head Pressure, kPa	391.5
Back Pressure, kPa	379.9
B - Value	0.97
Effective Consolidation Pressure, kPa	18.20
Volume under Steady Flow, cm <sup>3</sup>	1.1
Hydraulic Gradient, <i>i</i>	29.8
<b>Hydraulic Conductivity, <i>k</i><sub>20</sub>, cm/sec</b>	<b>1.5E-08</b>



**REMARKS:** The material meets the project specifications.

**PERFORMED BY:** Casey Adachi      **DATE:** Oct 4 - Oct 10, 2017

**VERIFIED BY:** Michael Braverman      **DATE:** October 11, 2017





**HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS (ASTM D5084)**

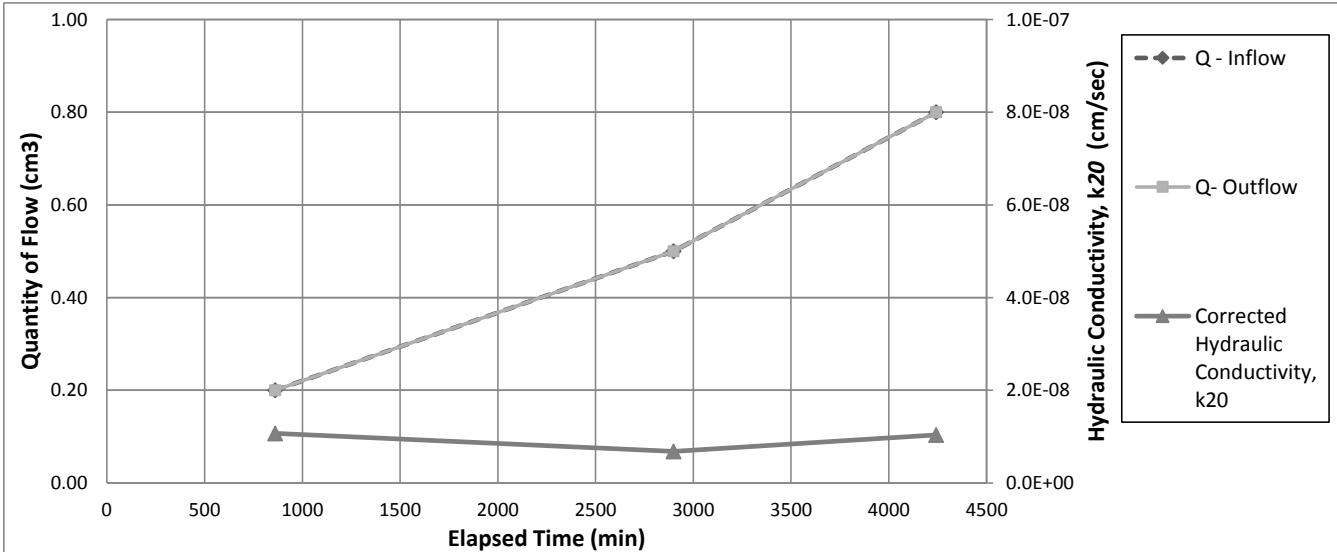
<b>CLIENT:</b>	Terrapure Environmental	<b>LAB No.:</b>	WLB-1329-3
<b>PROJECT/ SITE:</b>	Terrapure - Stoney Creek Landfill, 65 Green Mountain Road W, Hamilton	<b>PROJECT No.:</b>	11103232
<b>Sample Location:</b>	-	<b>Sampled By:</b>	Client
<b>Sample Height/Depth:</b>	-	<b>Date Sampled:</b>	-
<b>Sample Identification:</b>	3A	<b>Date Tested:</b>	Oct 4 - Oct 10, 2017

**Method C- Falling Head, Rising Tailwater Elevation**

**Sample Description:** silty CLAY, trace sand, trace gravel

Specimen Parameters	Initial	Final
Diameter, cm	3.79	
Length, cm	4.00	
Volume, cm <sup>3</sup>	45.1	
Wet Mass, g	96.9	
Dry Density, kg/m <sup>3</sup>	1835	1835
Moisture, %	17.1	18.1
Specific Gravity	2.75	
Degree of Saturation, %	95	100
Largest Particle Size, mm	4.75	

Permeation Condition	
Cell Pressure, kPa	400.5
Head Pressure, kPa	391.7
Back Pressure, kPa	379.9
B - Value	0.91
Effective Consolidation Pressure, kPa	18.60
Volume under Steady Flow, cm <sup>3</sup>	0.8
Hydraulic Gradient, <i>i</i>	30.1
<b>Hydraulic Conductivity, <i>k</i><sub>20</sub>, cm/sec</b>	<b>8.8E-09</b>



**REMARKS:** The material meets the project specifications

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**PERFORMED BY:** Casey Adachi      **DATE:** Oct 4 - Oct 10, 2017

**VERIFIED BY:** Michael Braverman      **DATE:** October 11, 2017



**HYDRAULIC CONDUCTIVITY OF  
SATURATED POROUS MATERIALS  
(ASTM D5084)**

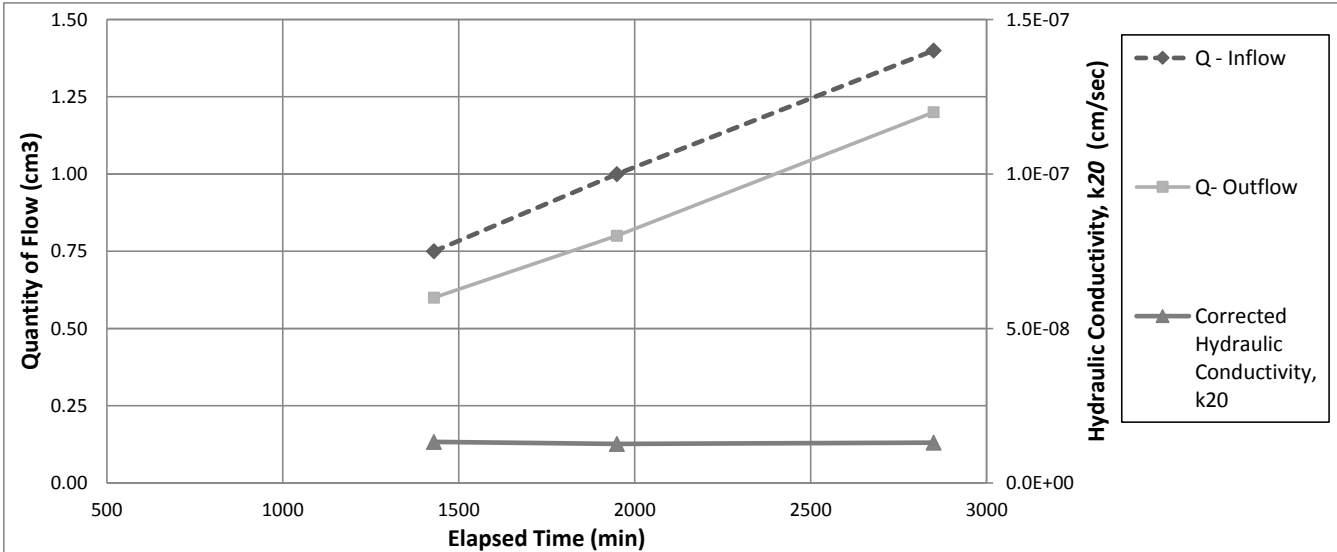
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<b>PROJECT/ SITE:</b>	Terrapure - Stoney Creek Landfill, 65 Green Mountain Road W, Hamilton	<b>PROJECT No.:</b>	11103232
<b>Sample Location:</b>	-	<b>Sampled By:</b>	-
<b>Sample Height/Depth:</b>	-	<b>Date Sampled:</b>	-
<b>Sample Identification:</b>	4A	<b>Date Tested:</b>	December 4 - 8, 2017

**Method C- Falling Head, Rising Tailwater Elevation**

<b>Sample Description:</b>	Lean clay with sand (CL)
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Specimen Parameters	Initial	Final
Diameter, cm	5.09	
Length, cm	5.84	
Volume, cm <sup>3</sup>	118.8	
Wet Mass, g	252.1	
Dry Density, kg/m <sup>3</sup>	1760	1771
Moisture, %	20.6	20.1
Specific Gravity	2.75	
Degree of Saturation, %	100	100
Largest Particle Size, mm	4.75	

Permeation Condition	
Cell Pressure, kPa	215.0
Head Pressure, kPa	203.8
Back Pressure, kPa	188.7
B - Value	0.99
Effective Consolidation Pressure, kPa	24.30
Volume under Steady Flow, cm <sup>3</sup>	1.2
Hydraulic Gradient, <i>i</i>	26.4
<b>Hydraulic Conductivity, <i>k</i><sub>20</sub>, cm/sec</b>	<b>1.3E-08</b>



**REMARKS:** The material meets the project specifications

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**PERFORMED BY:** Casey Adachi      **DATE:** December 4 - 8, 2017

**VERIFIED BY:** Michael Braverman      **DATE:** December 13, 2017



**HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS (ASTM D5084)**

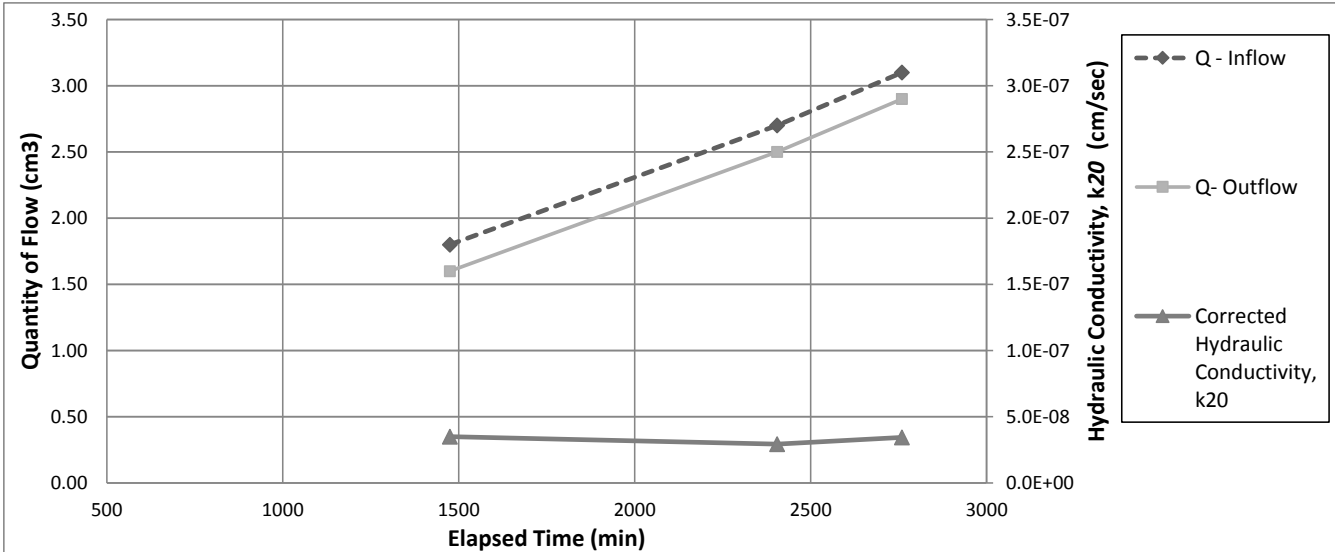
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<b>PROJECT/ SITE:</b>	Terrapure - Stoney Creek Landfill, 65 Green Mountain Road W, Hamilton	<b>PROJECT No.:</b>	11103232
<b>Sample Location:</b>	-	<b>Sampled By:</b>	-
<b>Sample Height/Depth:</b>	-	<b>Date Sampled:</b>	-
<b>Sample Identification:</b>	5A	<b>Date Tested:</b>	December 4 - 8, 2017

**Method C- Falling Head, Rising Tailwater Elevation**

<b>Sample Description:</b>	Lean clay with sand (CL)
----------------------------	--------------------------

Specimen Parameters	Initial	Final
Diameter, cm	5.07	
Length, cm	5.93	
Volume, cm <sup>3</sup>	119.5	
Wet Mass, g	244.5	
Dry Density, kg/m <sup>3</sup>	1730	1733
Moisture, %	18.3	21.3
Specific Gravity	2.75	
Degree of Saturation, %	85	100
Largest Particle Size, mm	4.75	

Permeation Condition	
Cell Pressure, kPa	315.0
Head Pressure, kPa	303.2
Back Pressure, kPa	288.0
B - Value	0.98
Effective Consolidation Pressure, kPa	25.00
Volume under Steady Flow, cm <sup>3</sup>	2.9
Hydraulic Gradient, <i>i</i>	26.1
<b>Hydraulic Conductivity, <i>k</i><sub>20</sub>, cm/sec</b>	<b>3.3E-08</b>



**REMARKS:** The material meets the project specifications

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<b>PERFORMED BY:</b>	Casey Adachi	<b>DATE:</b>	December 4 - 8, 2017
<b>VERIFIED BY:</b>	Michael Braverman	<b>DATE:</b>	December 13, 2017



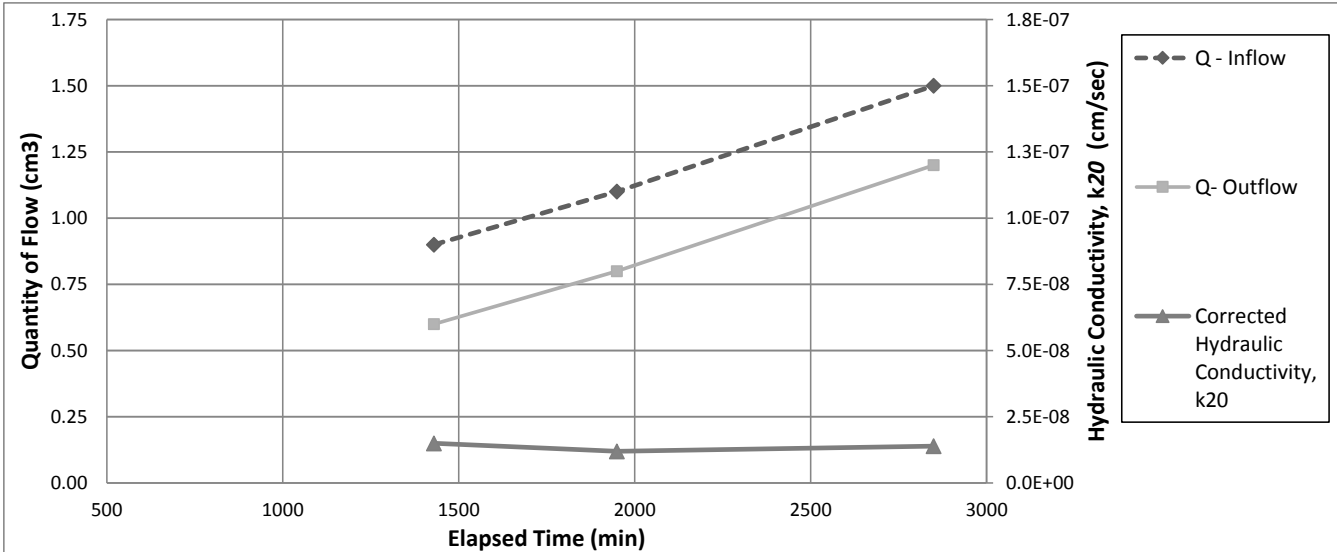
**HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS (ASTM D5084)**

<b>CLIENT:</b>	Terrapure Environmental	<b>LAB No.:</b>	WLB 1367-3
<b>PROJECT/ SITE:</b>	Terrapure - Stoney Creek Landfill, 65 Green Mountain Road W, Hamilton	<b>PROJECT No.:</b>	11103232
<b>Sample Location:</b>	-	<b>Sampled By:</b>	-
<b>Sample Height/Depth:</b>	-	<b>Date Sampled:</b>	-
<b>Sample Identification:</b>	6A	<b>Date Tested:</b>	December 4 - 8, 2017

**Method C- Falling Head, Rising Tailwater Elevation**

<b>Sample Description:</b>	Lean clay with sand (CL)
----------------------------	--------------------------

Specimen Parameters	Initial	Final	Permeation Condition	
Diameter, cm	5.09		Cell Pressure, kPa	215.0
Length, cm	5.95		Head Pressure, kPa	203.3
Volume, cm <sup>3</sup>	121.1		Back Pressure, kPa	188.8
Wet Mass, g	255.4		B - Value	0.98
Dry Density, kg/m <sup>3</sup>	1793	1800	Effective Consolidation Pressure, kPa	24.20
Moisture, %	17.6	19.3	Volume under Steady Flow, cm <sup>3</sup>	1.2
Specific Gravity	2.75		Hydraulic Gradient, <i>i</i>	24.8
Degree of Saturation, %	91	100	<b>Hydraulic Conductivity, <i>k</i><sub>20</sub>, cm/sec</b>	<b>1.4E-08</b>
Largest Particle Size, mm	4.75			



**REMARKS:** The material meets the project specifications

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**PERFORMED BY:** Casey Adachi      **DATE:** December 4 - 8, 2017

**VERIFIED BY:** Michael Braverman      **DATE:** December 13, 2017



**HYDRAULIC CONDUCTIVITY OF  
SATURATED POROUS MATERIALS  
(ASTM D5084)**

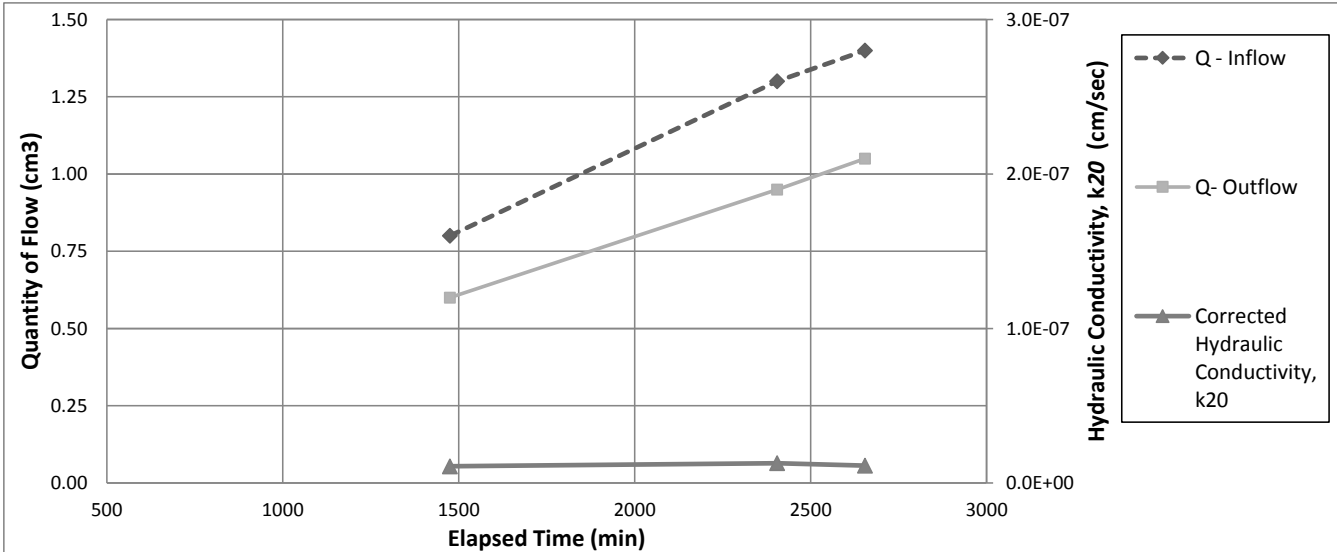
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<b>PROJECT/ SITE:</b>	Terrapure - Stoney Creek Landfill, 65 Green Mountain Road W, Hamilton	<b>PROJECT No.:</b>	11103232
<b>Sample Location:</b>	-	<b>Sampled By:</b>	-
<b>Sample Height/Depth:</b>	-	<b>Date Sampled:</b>	-
<b>Sample Identification:</b>	7A	<b>Date Tested:</b>	December 4 - 8, 17

**Method C- Falling Head, Rising Tailwater Elevation**

<b>Sample Description:</b>	Lean clay (CL)
----------------------------	----------------

Specimen Parameters	Initial	Final
Diameter, cm	5.14	
Length, cm	5.92	
Volume, cm <sup>3</sup>	123.0	
Wet Mass, g	252.5	
Dry Density, kg/m <sup>3</sup>	1740	1745
Moisture, %	18.0	21.0
Specific Gravity	2.75	
Degree of Saturation, %	85	100
Largest Particle Size, mm	4.75	

Permeation Condition	
Cell Pressure, kPa	315.0
Head Pressure, kPa	303.5
Back Pressure, kPa	287.8
B - Value	0.98
Effective Consolidation Pressure, kPa	25.20
Volume under Steady Flow, cm <sup>3</sup>	1.1
Hydraulic Gradient, <i>i</i>	27.0
<b>Hydraulic Conductivity, <i>k</i><sub>20</sub>, cm/sec</b>	<b>1.2E-08</b>



**REMARKS:** The material meets the project specifications

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<b>PERFORMED BY:</b>	Casey Adachi	<b>DATE:</b>	December 4 - 8, 17
<b>VERIFIED BY:</b>	Michael Braverman	<b>DATE:</b>	December 13, 2017



**HYDRAULIC CONDUCTIVITY OF  
SATURATED POROUS MATERIALS  
(ASTM D5084)**

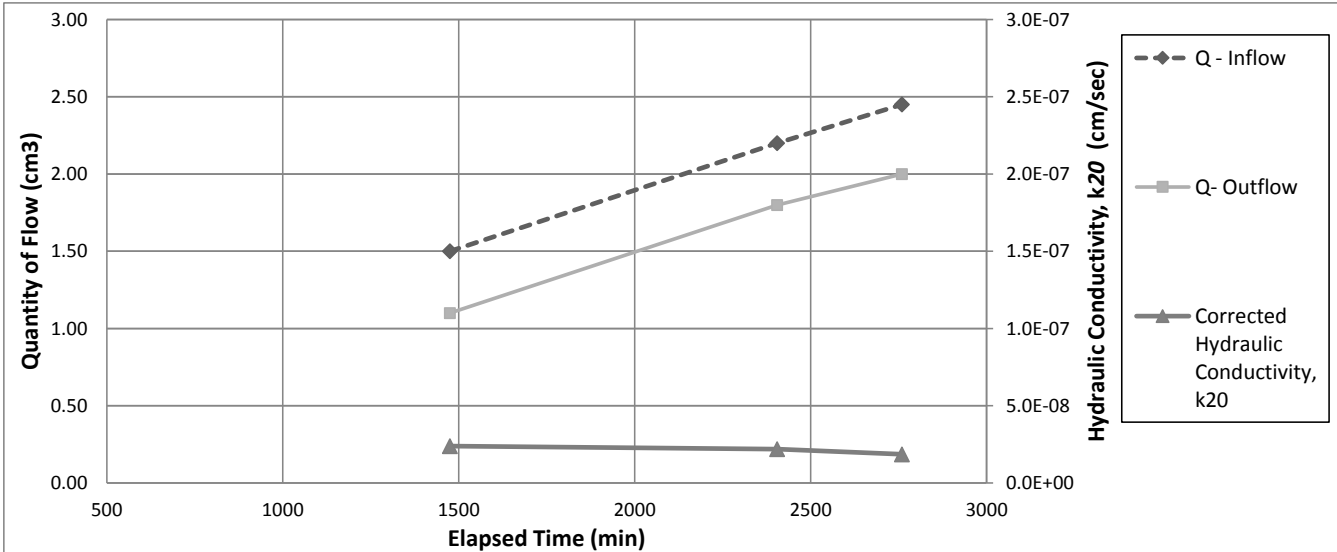
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<b>PROJECT/ SITE:</b>	Terrapure - Stoney Creek Landfill, 65 Green Mountain Road W, Hamilton	<b>PROJECT No.:</b>	11103232
<b>Sample Location:</b>	-	<b>Sampled By:</b>	-
<b>Sample Height/Depth:</b>	-	<b>Date Sampled:</b>	-
<b>Sample Identification:</b>	8A	<b>Date Tested:</b>	December 4 -8, 2017

**Method C- Falling Head, Rising Tailwater Elevation**

<b>Sample Description:</b>	Lean clay with sand (CL)
----------------------------	--------------------------

Specimen Parameters	Initial	Final
Diameter, cm	5.15	
Length, cm	6.01	
Volume, cm <sup>3</sup>	125.2	
Wet Mass, g	256.4	
Dry Density, kg/m <sup>3</sup>	1777	1780
Moisture, %	15.2	19.8
Specific Gravity	2.75	
Degree of Saturation, %	77	100
Largest Particle Size, mm	4.75	

Permeation Condition	
Cell Pressure, kPa	315.0
Head Pressure, kPa	303.9
Back Pressure, kPa	288.5
B - Value	0.98
Effective Consolidation Pressure, kPa	24.50
Volume under Steady Flow, cm <sup>3</sup>	2.0
Hydraulic Gradient, <i>i</i>	26.1
<b>Hydraulic Conductivity, <i>k</i><sub>20</sub>, cm/sec</b>	<b>2.5E-08</b>



**REMARKS:** The material meets the project specifications

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**PERFORMED BY:** Casey Adachi      **DATE:** December 4 -8, 2017

**VERIFIED BY:** Michael Braverman      **DATE:** December 13, 2017



**HYDRAULIC CONDUCTIVITY OF  
SATURATED POROUS MATERIALS  
(ASTM D5084)**

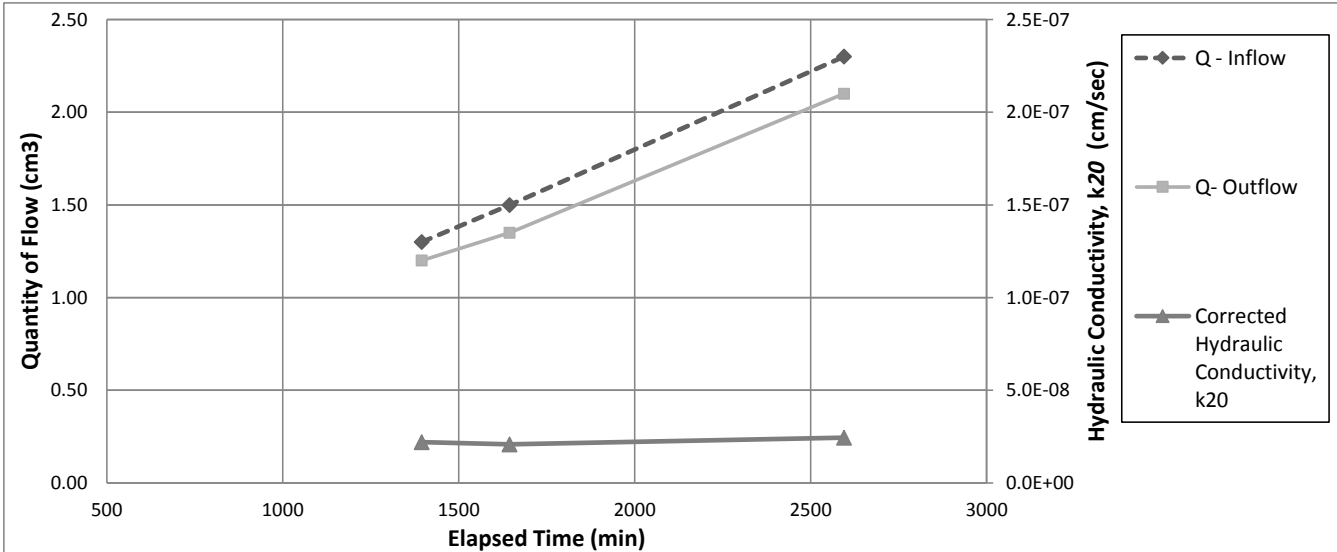
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<b>PROJECT/ SITE:</b>	Terrapure - Stoney Creek Landfill, 65 Green Mountain Road W, Hamilton	<b>PROJECT No.:</b>	11103232
<b>Sample Location:</b>	-	<b>Sampled By:</b>	-
<b>Sample Height/Depth:</b>	-	<b>Date Sampled:</b>	-
<b>Sample Identification:</b>	9A	<b>Date Tested:</b>	December 15 -19, 2017

**Method C- Falling Head, Rising Tailwater Elevation**

<b>Sample Description:</b>	Lean clay with sand (CL)
----------------------------	--------------------------

Specimen Parameters	Initial	Final
Diameter, cm	5.04	
Length, cm	5.99	
Volume, cm <sup>3</sup>	119.5	
Wet Mass, g	248.6	
Dry Density, kg/m <sup>3</sup>	1746	1755
Moisture, %	19.1	20.7
Specific Gravity	2.75	
Degree of Saturation, %	92	100
Largest Particle Size, mm	4.75	

Permeation Condition	
Cell Pressure, kPa	415.5
Head Pressure, kPa	403.7
Back Pressure, kPa	388.1
B - Value	0.98
Effective Consolidation Pressure, kPa	25.40
Volume under Steady Flow, cm <sup>3</sup>	2.1
Hydraulic Gradient, <i>i</i>	26.6
<b>Hydraulic Conductivity, <i>k</i><sub>20</sub>, cm/sec</b>	<b>2.2E-08</b>



**REMARKS:** The material meets the project specifications

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<b>PERFORMED BY:</b>	Casey Adachi	<b>DATE:</b>	December 15 -19, 2017
<b>VERIFIED BY:</b>	Michael Braverman	<b>DATE:</b>	December 22, 2017

# Appendix G

## Field Inspection Records





# Field Inspection Record

**Job Number:** 11103232 **Date:** 15 September, 2017  
**Owner:** Terrapure Environmental  
**Job Name:** Phase 8A Geotextile Seam Test Pit  
**Contractor:** Dufferin  
**Inspected By:** Peter Lesieczko **Weather:** 27°C, Sunny

**Type of Inspection:** Geotextile seam test pit below hydraulic control layer, visual inspection

**Location:** Phase 8A – N1300, E1050

**Description:** A test pit, approximately 0.75 m x 0.75 m, was excavated and then hand dug in the 2" clear stone of the hydraulic control layer to expose the underlying Type A geotextile.

- No foreign objects were observed in the stone, and the geotextile was in good condition, with no visible damage to the material or seams.
- The excavation was backfilled, compacted and re-graded in accordance with the specifications.



# Field Inspection Record

**Job Number:** 11103232 **Date:** 10 October 2017  
**Owner:** Terrapure Environmental  
**Job Name:** Phase 8A Geotextile Seam Test Pit  
**Contractor:** Dufferin  
**Inspected By:** Peter Lesieczko **Weather:** 22°C, Clear sky

**Type of Inspection:** Geotextile seam test pit below leachate collection layer, visual inspection

**Location:** Phase 8A – N1325, E1150

**Description:** A test pit, approximately 1 m x .3 m, was hand dug in the 19 mm clear stone of the leachate control layer to expose the underlying Type B geotextile.

- No foreign objects were observed in the stone, and the geotextile was in good condition, with no visible damage to the material or seams.
- The excavation was backfilled, compacted and re-graded in accordance with the specifications.



# Field Inspection Record

**Job Number:** 11103232 **Date:** 25 September, 2017  
**Owner:** Terrapure Environmental  
**Job Name:** Phase 8A Geotextile Seam Test Pit on top of HCL  
**Contractor:** Dufferin  
**Inspected By:** Peter Lesieczko **Weather:** 27°C, Sunny

**Type of Inspection:** Geotextile seam test pit below primary clay liner, visual inspection

**Location:** Phase 8A – N1325, E1175

**Description:** A test pit was conducted in the Primary Clay Liner to expose the Geotextile A. Approximately 0.5 m x 0.5 m was excavated on the surface layer and then hand dug down to the Geotextile A.

- Two (2) small cobblestones were found in the bottom lift and removed before backfilling. Increased effort in stone picking was implemented, added additional personnel to stone picking, and added scarification method to comb through placed material.
- The geotextile was observed to be in good condition, with no visible damage to the material or seams.
- The excavation was backfilled, compacted and re-graded in accordance with the specifications.



# Field Inspection Record

**Job Number:** 11103232 **Date:** November 7<sup>th</sup>, 2017  
**Owner:** Terrapure Environmental  
**Job Name:** Phase 8A Primary Clay Liner Test Pit - #2  
**Contractor:** Dufferin  
**Inspected By:** Peter Lesieczko **Weather:** 9°C, Sunny with some clouds

**Type of Inspection:** Primary clay liner test pit, visual inspection

**Location:** Phase 8A – N1314.494, E1087.445

**Description:** An excavator was used to remove the top 3 lifts (600 mm) of compacted Primary Clay Liner. The area excavated was 2 m by 2 m. A shovel was used to remove loose clay from the sides of the excavation. The uniformity of the clay material was observed and checked for deficiencies:

- The clay appeared to be homogenous with no stratification observed between the different lifts.
- No gravel was found.
- The clay was dark brown and moist.
- One (1) cobble (<50 mm) was found on the bottom lifts of the clay liner. The cobble was removed prior to backfilling. Increased effort in stone picking was implemented.
- Test pit corresponds to the location for Shelby Tube Set #6.
- The PCL passed inspection within this area.
- The hole was then backfilled, compacted in lifts, benched into the surrounding liner and re-graded as per the drawings and specifications.



# Field Inspection Record

**Job Number:** 11103232 **Date:** November 7<sup>th</sup>, 2017  
**Owner:** Terrapure Environmental  
**Job Name:** Phase 8A Primary Clay Liner Test Pit - #3  
**Contractor:** Dufferin  
**Inspected By:** Peter Lesieczko **Weather:** 9°C, Sunny with some clouds

**Type of Inspection:** Primary clay liner test pit, visual inspection

**Location:** Phase 8A – N1373, E1289

**Description:** An excavator was used to remove approximately the top 2 lifts (400 mm) of compacted Primary Clay Liner. The area excavated was 4 m by 2 m. A shovel was used to remove loose clay from the sides of the excavation. The uniformity of the clay material was observed and checked for deficiencies:

- The clay appeared to be homogenous with no stratification observed between the different lifts. The surface layer appeared homogenous with the bottom lifts of clay.
- No gravel was found.
- The clay was dark brown and moist.
- Test pit corresponds to the location for Shelby Tube Set #9 and the second set of permeameters.
- The PCL passed inspection within this area.
- The hole was then backfilled, compacted in lifts, benched into the surrounding liner and re-graded as per the drawings and specifications.



# Field Inspection Record

**Job Number:** 11103232 **Date:** October 31<sup>st</sup>, 2017  
**Owner:** Terrapure Environmental  
**Job Name:** Phase 8A Primary Clay Liner Test Pit  
**Contractor:** Dufferin  
**Inspected By:** Peter Lesieczko **Weather:** 8°C, Sunny with some clouds

**Type of Inspection:** Primary clay liner test pit, visual inspection

**Location:** Phase 8A – N1350, E1275

**Description:** An excavator was used to remove the top 2.5 lifts (500 mm) of compacted Primary Clay Liner. The area excavated was 2 m by 2 m. A shovel was used to remove loose clay from the sides of the excavation. The uniformity of the clay material was observed and checked for deficiencies:

- The clay appeared to be homogenous with no stratification observed between the different lifts.
- No gravel was found.
- The clay was dark brown and moist.
- One (1) cobble (<50 mm) was found on the bottom lifts of the clay liner. The cobble was removed prior to backfilling. Increased effort in stone picking was implemented.
- Test pit corresponds to the location for Shelby Tube Set #5.
- The PCL passed inspection within this area.
- The hole was then backfilled, compacted in lifts, benched into the surrounding liner and re-graded as per the drawings and specifications.



# Field Inspection Record

**Job Number:** 11103232 **Date:** September 27<sup>th</sup>, 2017  
**Owner:** Terrapure Environmental  
**Job Name:** Phase 8A Secondary Clay Liner Test Pit - #2  
**Contractor:** Dufferin  
**Inspected By:** Peter Lesieczko **Weather:** 25°C, Sunny

**Type of Inspection:** Secondary clay liner test pit, visual inspection

**Location:** Phase 8A – N1316, E1190

**Description:** An excavator was used to remove the top 3 – 4 lifts (600 mm – 800 mm) of compacted Secondary Clay Liner. The pit was 1 meter by 1 meter. A shovel was used to remove loose clay from the sides of the excavation. The uniformity of the clay material was observed and checked for deficiencies:

- The clay appeared to be homogenous with no stratification observed between the different lifts.
- No gravel was found.
- The clay was dark brown and moist.
- One (1) cobble (approximately 50 mm in size) was found on the bottom lifts of the clay liner. The cobble was removed prior to backfilling. Increased effort in stone picking was enforced.
- Test pit corresponds to the location for Shelby Tube Set #3 and permeameter set #2 for Secondary Clay Liner.
- The SCL passed inspection within this area.
- The hole was then backfilled, compacted in lifts, benched into the surrounding liner and re-graded as per the drawings and specifications.



# Field Inspection Record

**Job Number:** 11103232 **Date:** October 16<sup>th</sup>, 2017  
**Owner:** Terrapure Environmental  
**Job Name:** Phase 8A Secondary Clay Liner Test Pit - #3  
**Contractor:** Dufferin  
**Inspected By:** Peter Lesieczko **Weather:** 12°C, Clear sky

**Type of Inspection:** Secondary clay liner test pit, visual inspection

**Location:** Phase 8A – N1354.53, E1265.82

**Description:** An excavator was used to remove the top 3 lifts (600 mm) of compacted Secondary Clay Liner. The pit was 1 meter by 1 meter. A shovel was used to remove loose clay from the sides of the excavation. The uniformity of the clay material was observed and checked for deficiencies:

- The clay appeared to be homogenous with no stratification observed between the different lifts.
- No gravel was found.
- The clay was dark brown and moist.
- No cobbles were found on the bottom lifts of the clay liner.
- Test pit corresponds to the location for permeameter set #3 for secondary clay liner.
- The SCL passed inspection within this area.
- The hole was then backfilled, compacted in lifts, benched into the surrounding liner and re-graded as per the drawings and specifications.





# Field Inspection Record

**Job Number:** 11103232 **Date:** September 15<sup>th</sup>, 2017  
**Owner:** Terrapure Environmental  
**Job Name:** Phase 8A Secondary Clay Liner Test Pit  
**Contractor:** Dufferin  
**Inspected By:** Peter Lesieczko **Weather:** 27°C, Sunny

**Type of Inspection:** Secondary clay liner test pit, visual inspection

**Location:** Phase 8A – N1300, E1025

**Description:** An excavator was used to remove the top 3 – 4 lifts (600 mm – 800 mm) of compacted Secondary Clay Liner. A shovel was used to remove loose clay from the sides of the excavation. The uniformity of the clay material was observed and checked for deficiencies:

- The clay appeared to be homogenous with no stratification observed between the different lifts.
- No gravel was found.
- The clay was dark brown and moist.
- Two (2) cobbles were found on the bottom lifts of the clay liner. The cobbles were removed prior to backfilling. Increased effort in stone picking was implemented, added additional personnel to stone picking, and added scarification method to comb through placed material.
- Test pit corresponds to the location for Shelby Tube Set #1.
- The SCL passed inspection within this area.
- The hole was then backfilled, compacted in lifts, benched into the surrounding liner and re-graded as per the drawings and specifications.

# Appendix H

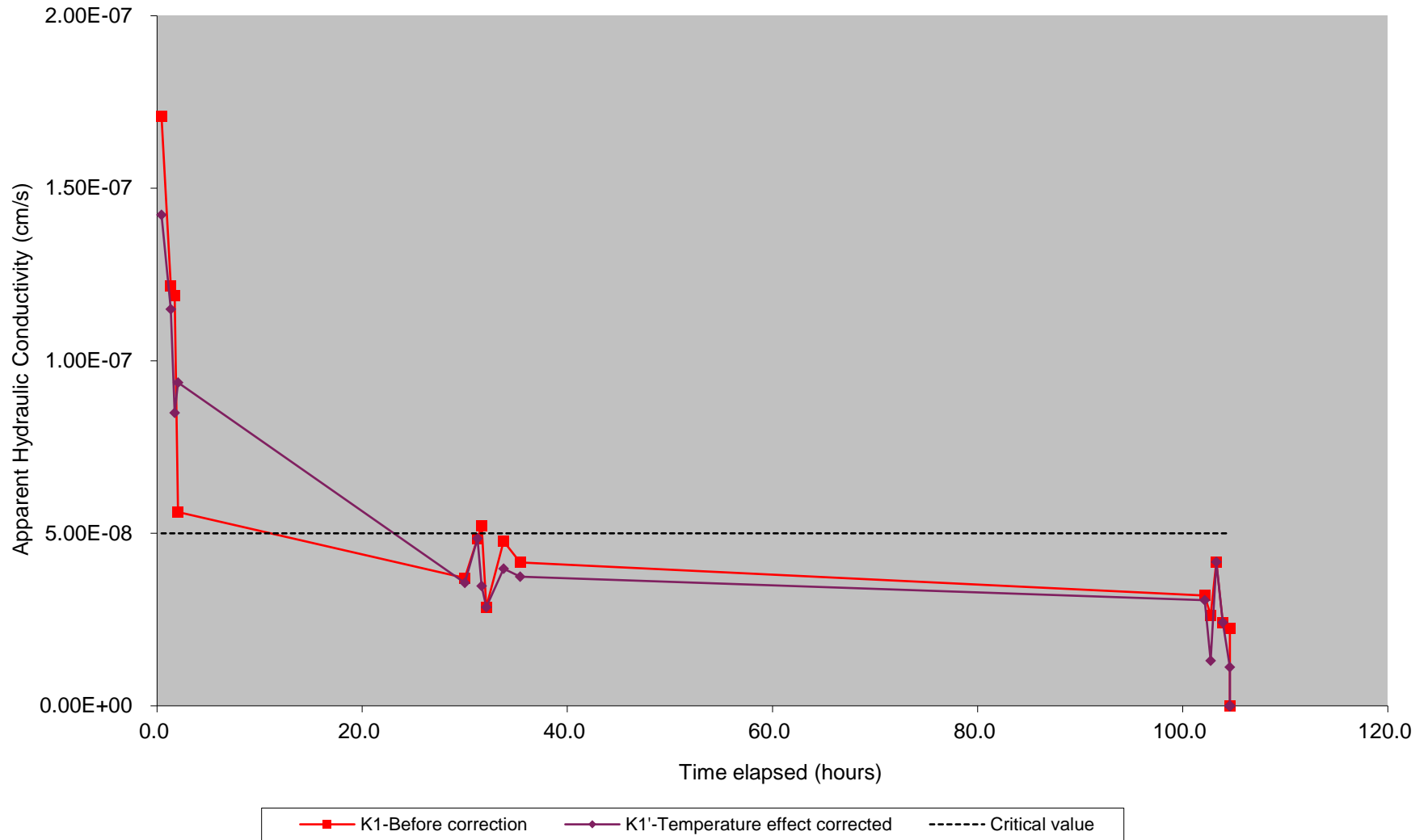
## In-situ Hydraulic Conductivity Test Results

# Appendix H1

## Permeameter Results for the Primary Clay Liner

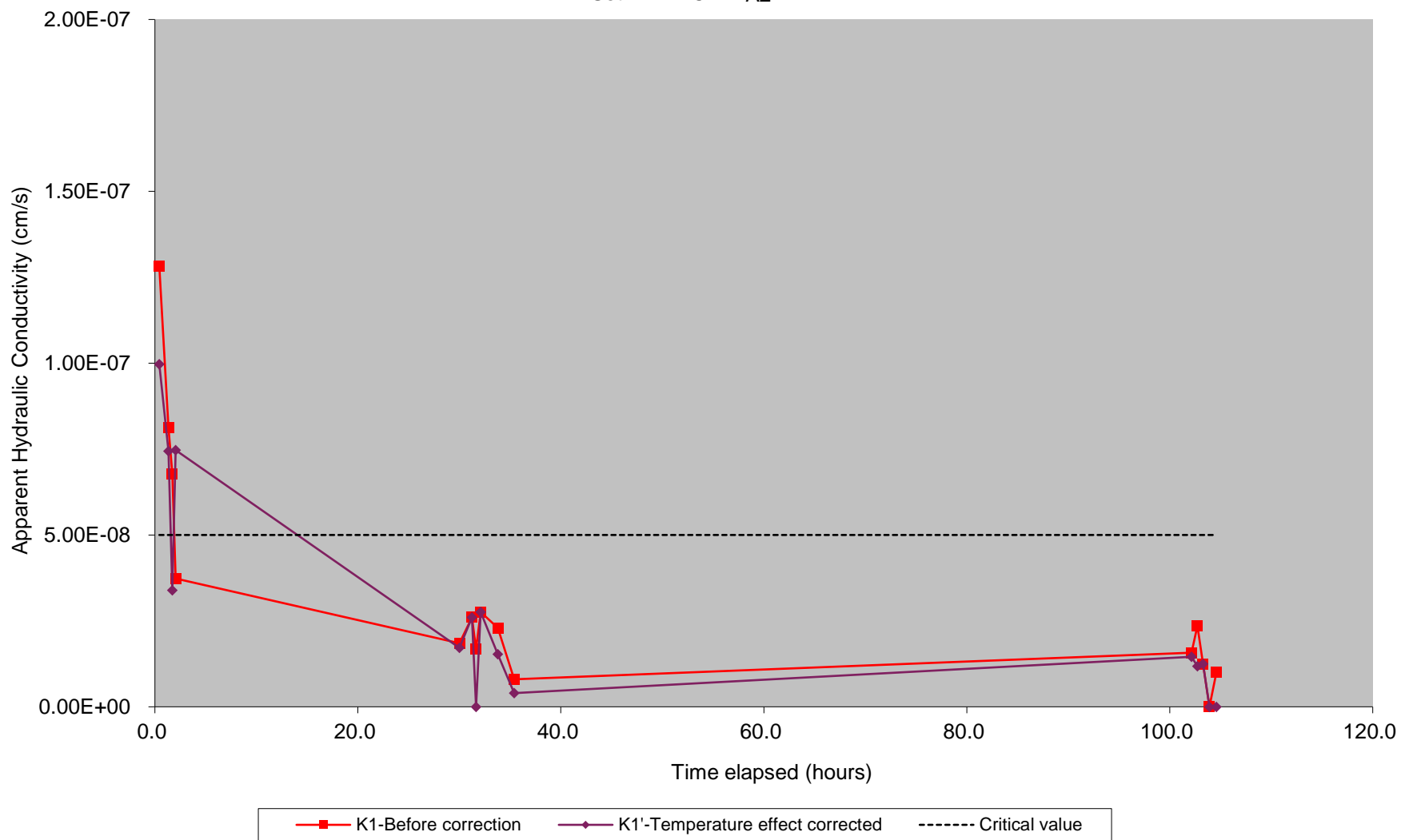


Terrapure Environmental - Phase 8A  
Stoney Creek Landfill - Phase 8A  
Set 1 - PGL A1





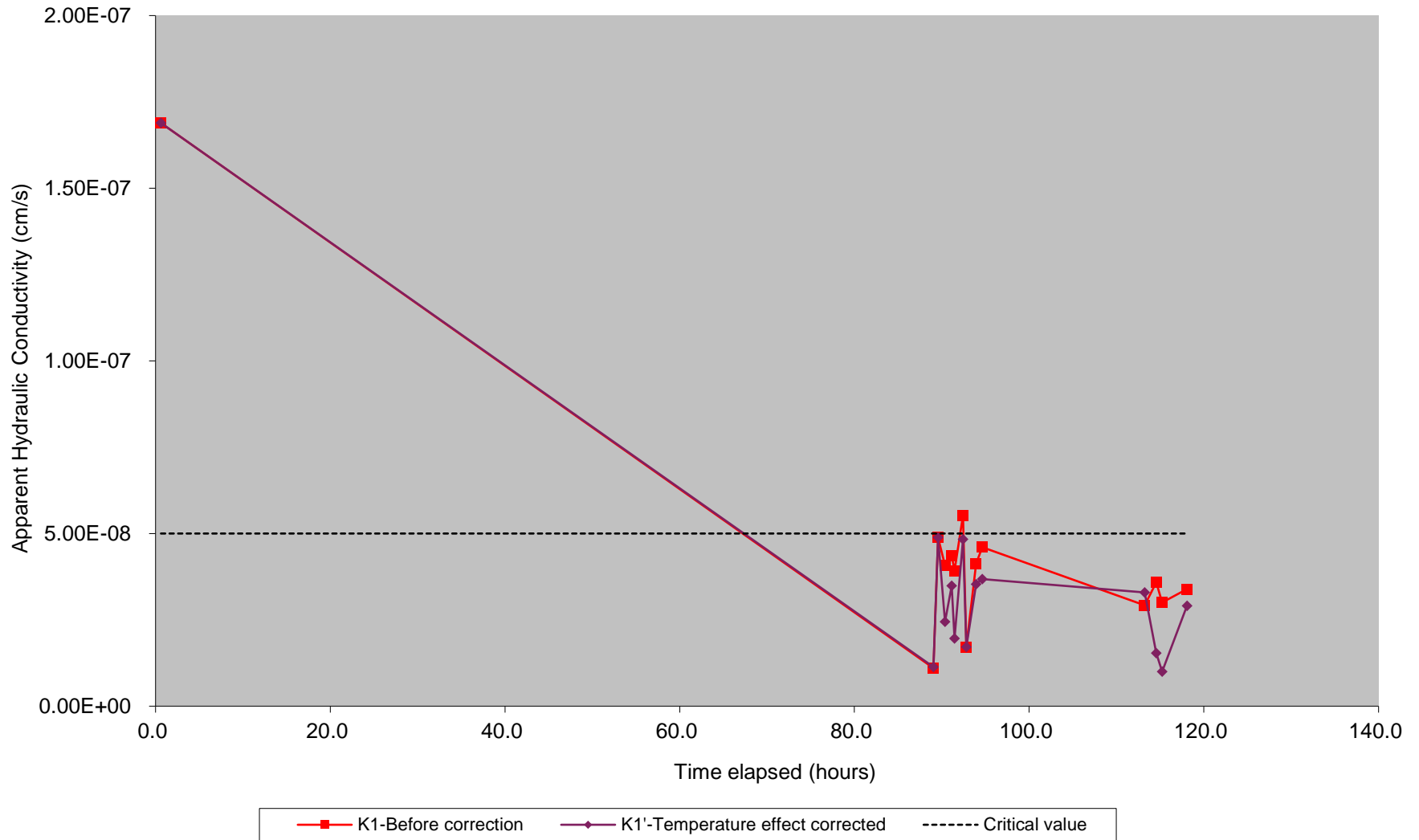
Terrapure Environmental - Phase 8A  
Stoney Creek Landfill - Phase 8A  
Set 1 - PGL A2





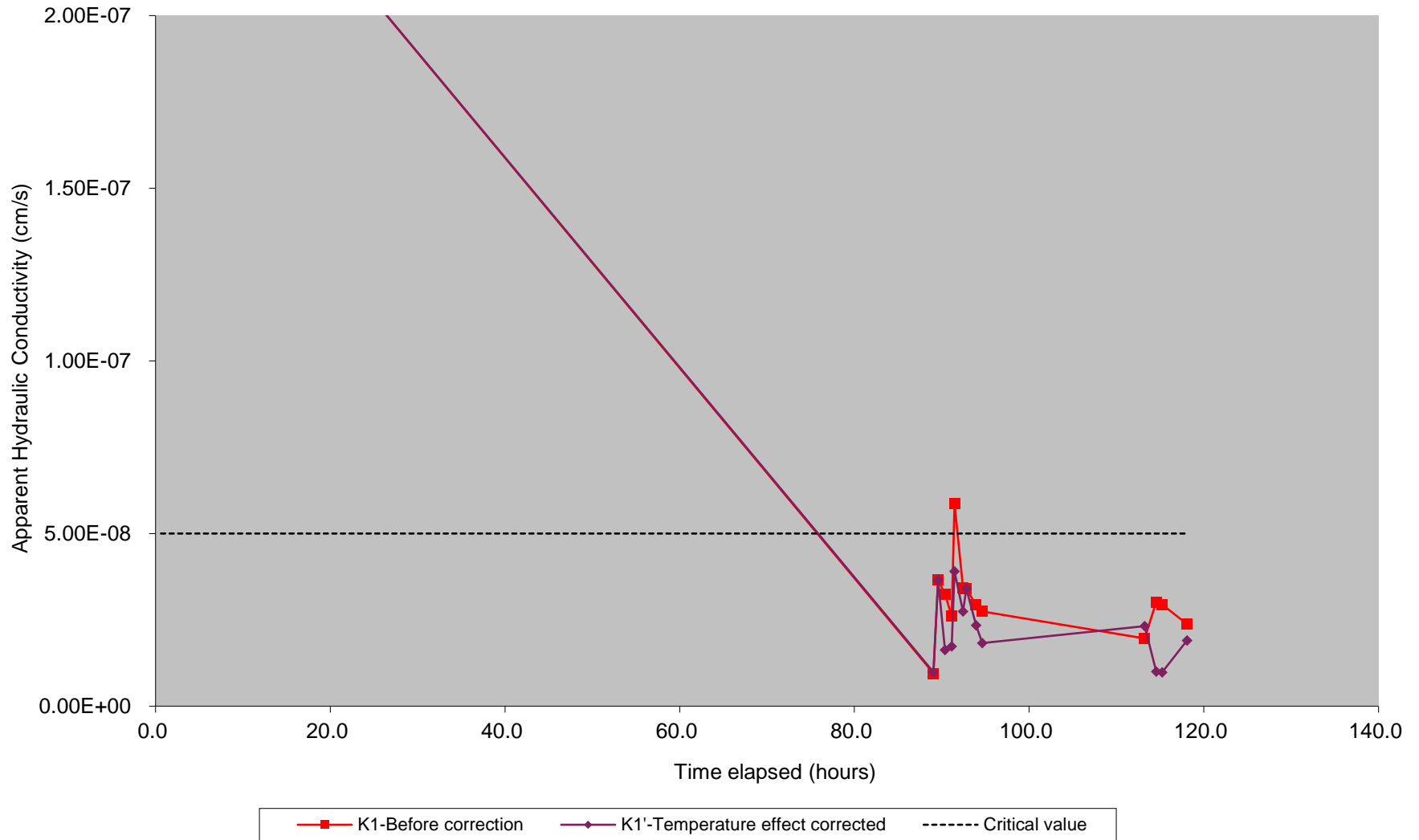


Terrapure Environmental - Phase 8A  
Stoney Creek Landfill - Phase 8A  
Set 2 - PGL B1





Terrapure Environmental - Phase 8A  
Stoney Creek Landfill - Phase 8A  
Set 2 - PGL B2



# Appendix H2

## Permeameter Results for the Secondary Clay Liner

**ONE-STAGE BOREHOLE TEST (IN-SITU HYDRAULIC CONDUCTIVITY TEST) FOR COMPACTED CLAY LINER**

CLIENT: Terrapure Environmental  
 PROJECT: Stoney Creek Landfill - Phase 8A  
 LOCATION: Phase 8A  
 COMPONENT:  
 SET #: 1 - SCL  
 PERMEAMETER #: C1  
 NORTHING: 1300  
 EASTING: 1050

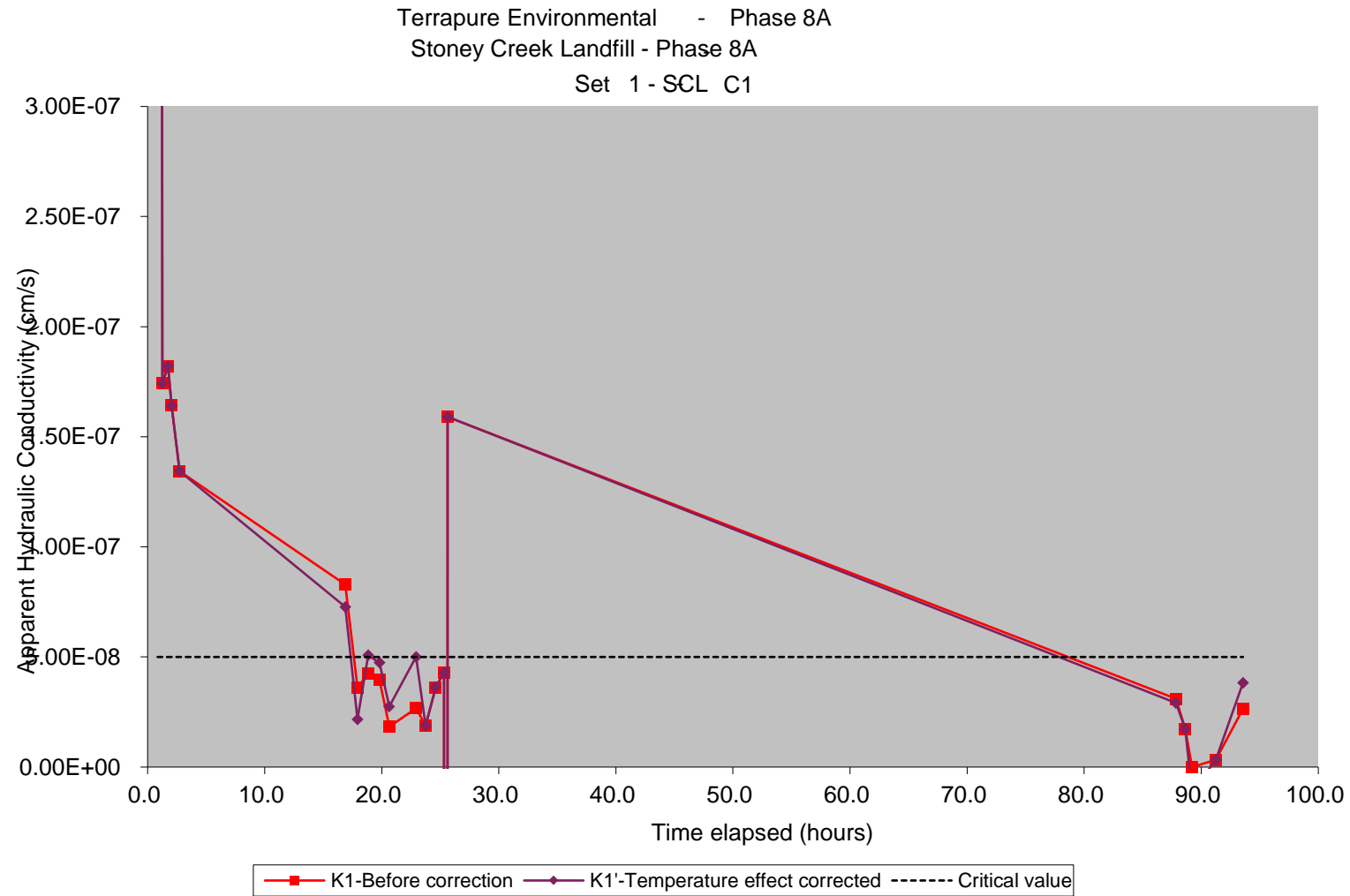
**STAGE 1 TEST CALCULATIONS (this table to be used only by staff experienced in this test)**

Input Parameters:		Calculated Parameters:
Internal diameter of tube, d =	15 (mm)	Geometric Constant, G1 = 0.6107362 (in mm) for pervious lower boundary (a = -1)
Internal diameter of casing, D =	101 (mm)	Depth of Clay below bottom of casing, b1 = 630 (mm)
Depth of casing base below ground, Z =	370 (mm)	Head at time t, Ht = Ra + R + 20xD (all in mm)
Reference point of scale above ground, Ra =	140 (mm)	H2' = H2 - c
Depth of Clay Liner =	1000 (mm)	

Reading to be recorded in all rows:

1. Date, and time (in minutes)
2. R (in mm) = water level in standpipe above the reference point of scale for the given permeameter at time t
3. C (mm) = water level in standpipe above the reference point of scale for the Temperature Effect Gauge during time period t
4. Temperature and Remarks

Date	Time	Time lapsed (minutes)	R (mm)	H1 (mm)	H2 (mm)	K1 (cm/s)	C (mm)	c (mm)	H2' (mm)	K1' (cm/s)	Temperature (°C)	Cumulated time (hr)	Remarks
14-Sep-17	15:26	0	600	-	2760	-	600	0	-	-	26.5	0.0	
14-Sep-17	16:17	51	278	2760	2438	2.48E-06	604	4	2434	2.51E-06	27.5	0.9	
14-Sep-17	16:41	24	268	2438	2428	1.74E-07	604	0	2428	1.74E-07	27.5	1.3	
14-Sep-17	17:11	30	255	2428	2415	1.82E-07	604	0	2415	1.82E-07	27.5	1.8	
14-Sep-17	17:29	18	248	2415	2408	1.64E-07	604	0	2408	1.64E-07	27.5	2.1	
14-Sep-17	18:10	41	235	2408	2395	1.34E-07	604	0	2395	1.34E-07	27.5	2.7	
15-Sep-17	8:19	849	75	2395	2235	8.29E-08	585	-19	2254	7.27E-08	18	16.9	
15-Sep-17	9:22	63	70	2235	2230	3.62E-08	583	-2	2232	2.17E-08	18.5	17.9	
15-Sep-17	10:16	54	65	2230	2225	4.23E-08	584	1	2224	5.08E-08	19.5	18.8	
15-Sep-17	11:14	58	60	2225	2220	3.95E-08	585	1	2219	4.74E-08	21	19.8	
15-Sep-17	12:04	50	58	2220	2218	1.83E-08	586	1	2217	2.75E-08	22.5	20.6	
15-Sep-17	14:22	138	50	2218	2210	2.67E-08	593	7	2203	5.01E-08	26.25	22.9	
15-Sep-17	15:11	49	48	2210	2208	1.88E-08	593	0	2208	1.88E-08	27	23.8	
15-Sep-17	16:02	51	44	2208	2204	3.62E-08	593	0	2204	3.62E-08	28	24.6	
15-Sep-17	16:45	43	40	2204	2200	4.30E-08	593	0	2200	4.30E-08	28.5	25.3	
15-Sep-17	16:48	3	643	2200	2803	-8.22E-05	593	0	2803	-8.22E-05	28.5	25.4	Refilled the permeameter
15-Sep-17	17:04	16	636	2803	2796	1.59E-07	593	0	2796	1.59E-07	28.5	25.6	
18-Sep-17	7:16	3732	336	2796	2496	3.10E-08	576	-17	2513	2.91E-08	18	87.8	
18-Sep-17	8:03	47	334	2496	2494	1.74E-08	576	0	2494	1.74E-08	18.5	88.6	
18-Sep-17	8:39	36	334	2494	2494	0.00E+00	575	-1	2495	-1.13E-08	19	89.2	Erroneous reading
18-Sep-17	10:41	122	333	2494	2493	3.35E-09	575	0	2493	3.35E-09	21	91.3	
18-Sep-17	13:00	139	324	2493	2484	2.65E-08	579	4	2480	3.83E-08	25	93.6	



**ONE-STAGE BOREHOLE TEST (IN-SITU HYDRAULIC CONDUCTIVITY TEST) FOR COMPACTED CLAY LINER**

CLIENT: Terrapure Environmental  
 PROJECT: Stoney Creek Landfill - Phase 8A  
 LOCATION: Phase 8A  
 COMPONENT:  
 SET #: 1 - SCL  
 PERMEAMETER #: C2  
 NORTHING: 1300  
 EASTING: 1050

**STAGE 1 TEST CALCULATIONS (this table to be used only by staff experienced in this test)**

Input Parameters: Internal diameter of tube, d = 15 (mm)  
 Internal diameter of casing, D = 101 (mm)  
 Depth of casing base below ground, Z = 343 (mm)  
 Reference point of scale above ground, Ra = 175 (mm)  
 Depth of Clay Liner = 1000 (mm)

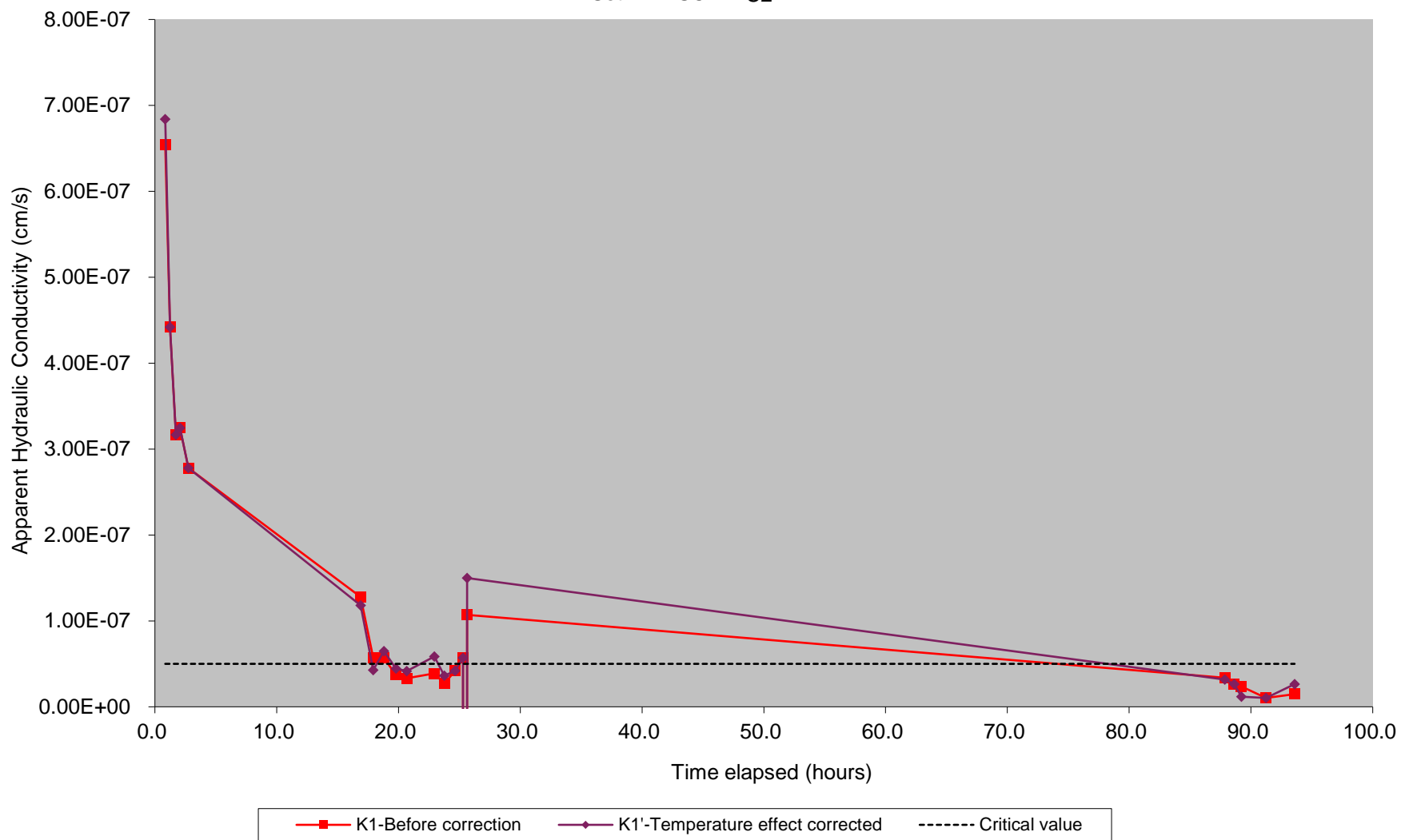
Calculated Parameters: Geometric Constant, G1 = 0.61178414 (in mm) for pervious lower boundary (a = -1)  
 Depth of Clay below bottom of casing, b1 = 657 (mm)  
 Head at time t, Ht = Ra + R + 20xD (all in mm)  
 H2' = H2 - c

Reading to be recorded in all rows:

1. Date, and time (in minutes)
2. R (in mm) = water level in standpipe above the reference point of scale for the given permeameter at time t
3. C (mm) = water level in standpipe above the reference point of scale for the Temperature Effect Gauge during time period t
4. Temperature and Remarks

Date	Time	Time lapsed (minutes)	R (mm)	H1 (mm)	H2 (mm)	K1 (cm/s)	C (mm)	c (mm)	H2' (mm)	K1' (cm/s)	Temperature (°C)	Cumulated time (hr)	Remarks
14-Sep-17	15:25	0	600	-	2795	-	600	0	-	-	26.5	0.0	
14-Sep-17	16:16	51	510	2795	2705	6.54E-07	604	4	2701	6.84E-07	27.5	0.9	
14-Sep-17	16:40	24	482	2705	2677	4.42E-07	604	0	2677	4.42E-07	27.5	1.3	
14-Sep-17	17:09	29	458	2677	2653	3.17E-07	604	0	2653	3.17E-07	27.5	1.7	
14-Sep-17	17:28	19	442	2653	2637	3.25E-07	604	0	2637	3.25E-07	27.5	2.1	
14-Sep-17	18:10	42	412	2637	2607	2.78E-07	604	0	2607	2.78E-07	27.5	2.8	
15-Sep-17	8:19	849	149	2607	2344	1.28E-07	585	-19	2363	1.18E-07	18	16.9	
15-Sep-17	9:20	61	141	2344	2336	5.71E-08	583	-2	2338	4.28E-08	18.5	17.9	
15-Sep-17	10:14	54	134	2336	2329	5.67E-08	584	1	2328	6.48E-08	19.5	18.8	
15-Sep-17	11:13	59	129	2329	2324	3.71E-08	585	1	2323	4.46E-08	21	19.8	
15-Sep-17	12:06	53	125	2324	2320	3.31E-08	586	1	2319	4.14E-08	22.5	20.7	
15-Sep-17	14:22	136	113	2320	2308	3.89E-08	592	6	2302	5.84E-08	26.25	23.0	
15-Sep-17	15:11	49	110	2308	2305	2.71E-08	593	1	2304	3.61E-08	27	23.8	
15-Sep-17	16:04	53	105	2305	2300	4.18E-08	593	0	2300	4.18E-08	28	24.7	
15-Sep-17	16:43	39	100	2300	2295	5.69E-08	593	0	2295	5.69E-08	28.5	25.3	
15-Sep-17	16:46	3	610	2295	2805	-6.82E-05	593	0	2805	-6.82E-05	28.5	25.4	Refilled the permeameter
15-Sep-17	17:03	17	605	2805	2800	1.07E-07	595	2	2798	1.50E-07	28.5	25.6	
18-Sep-17	7:16	3733	278	2800	2473	3.39E-08	576	-19	2492	3.18E-08	18	87.9	
18-Sep-17	8:03	47	275	2473	2470	2.63E-08	576	0	2470	2.63E-08	18.5	88.6	
18-Sep-17	8:38	35	273	2470	2468	2.36E-08	575	-1	2469	1.18E-08	19	89.2	
18-Sep-17	10:39	121	270	2468	2465	1.02E-08	575	0	2465	1.02E-08	21	91.2	
18-Sep-17	13:00	141	265	2465	2460	1.47E-08	579	4	2456	2.65E-08	25	93.6	

Terrapure Environmental - Phase 8A  
Stoney Creek Landfill - Phase 8A  
Set 1 - SGL C2





**ONE-STAGE BOREHOLE TEST (IN-SITU HYDRAULIC CONDUCTIVITY TEST) FOR COMPACTED CLAY LINER**

CLIENT: Terrapure Environmental  
 PROJECT: Stoney Creek Landfill - Phase 8A  
 LOCATION: Phase 8A  
 COMPONENT:  
 SET #: 2 - SCL  
 PERMEAMETER #: A1  
 NORTHING: 1354  
 EASTING: 1265

**STAGE 1 TEST CALCULATIONS (this table to be used only by staff experienced in this test)**

Input Parameters: Internal diameter of tube, d = 15 (mm)  
 Internal diameter of casing, D = 101 (mm)  
 Depth of casing base below ground, Z = 342 (mm)  
 Reference point of scale above ground, Ra = 170 (mm)  
 Depth of Clay Liner = 1000 (mm)

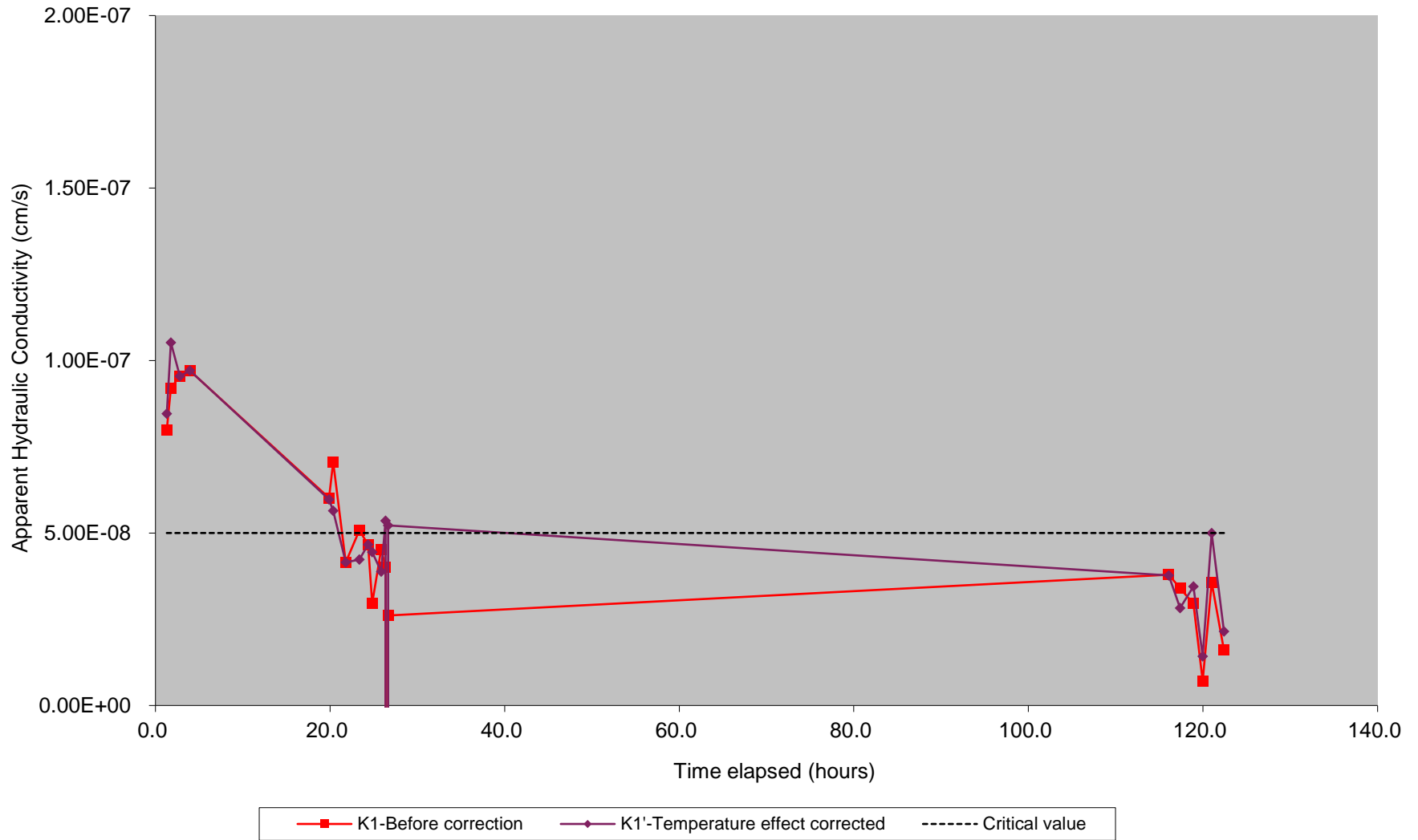
Calculated Parameters: Geometric Constant, G1 = 0.6118213 (in mm) for pervious lower boundary (a = -1)  
 Depth of Clay below bottom of casing, b1 = 658 (mm)  
 Head at time t, Ht = Ra + R + 20xD (all in mm)  
 H2' = H2 - c

Reading to be recorded in all rows:

1. Date, and time (in minutes)
2. R (in mm) = water level in standpipe above the reference point of scale for the given permeameter at time t
3. C (mm) = water level in standpipe above the reference point of scale for the Temperature Effect Gauge during time period t
4. Temperature and Remarks

Date	Time	Time lapsed (minutes)	R (mm)	H1 (mm)	H2 (mm)	K1 (cm/s)	C (mm)	c (mm)	H2' (mm)	K1' (cm/s)	Temperature (°C)	Cumulated time (hr)	Remarks
5-Oct-17	12:39	0	600	-	2790	-	600	0	-	-	20	0.0	
5-Oct-17	13:57	78	583	2790	2773	7.99E-08	601	1	2772	8.46E-08	21	1.3	
5-Oct-17	14:25	28	576	2773	2766	9.20E-08	602	1	2765	1.05E-07	21	1.8	Shelby tubes were collected nearby
5-Oct-17	15:27	62	560	2766	2750	9.54E-08	602	0	2750	9.54E-08	21	2.8	
5-Oct-17	16:36	69	542	2750	2732	9.70E-08	602	0	2732	9.70E-08	21	4.0	
6-Oct-17	8:33	957	392	2732	2582	6.02E-08	601	-1	2583	5.98E-08	16	19.9	
6-Oct-17	9:01	28	387	2582	2577	7.06E-08	600	-1	2578	5.65E-08	16	20.4	
6-Oct-17	10:27	86	378	2577	2568	4.15E-08	600	0	2568	4.15E-08	16	21.8	
6-Oct-17	12:01	94	366	2568	2556	5.08E-08	598	-2	2558	4.23E-08	16	23.4	
6-Oct-17	13:01	60	359	2556	2549	4.66E-08	598	0	2549	4.66E-08	17	24.4	
6-Oct-17	13:28	27	357	2549	2547	2.96E-08	599	1	2546	4.45E-08	18	24.8	
6-Oct-17	14:30	62	350	2547	2540	4.53E-08	598	-1	2541	3.88E-08	20	25.9	
6-Oct-17	15:00	30	347	2540	2537	4.02E-08	599	1	2536	5.36E-08	20	26.4	
6-Oct-17	15:04	4	600	2537	2790	-2.42E-05	599	0	2790	-2.42E-05	20	26.4	Refilled the permeameter
6-Oct-17	15:18	14	599	2790	2789	2.61E-08	600	1	2788	5.22E-08	20	26.7	
10-Oct-17	8:43	5365	95	2789	2285	3.79E-08	598	-2	2287	3.77E-08	16	116.1	
10-Oct-17	10:02	79	89	2285	2279	3.39E-08	597	-1	2280	2.83E-08	17	117.4	
10-Oct-17	11:33	91	83	2279	2273	2.95E-08	598	1	2272	3.45E-08	20	118.9	
10-Oct-17	12:36	63	82	2273	2272	7.12E-09	599	1	2271	1.42E-08	22	120.0	
10-Oct-17	13:39	63	77	2272	2267	3.57E-08	601	2	2265	4.99E-08	24	121.0	
10-Oct-17	15:03	84	74	2267	2264	1.61E-08	602	1	2263	2.14E-08	25	122.4	

Terrapure Environmental - Phase 8A  
Stoney Creek Landfill - Phase 8A  
Set 2 - SGL A1



**ONE-STAGE BOREHOLE TEST (IN-SITU HYDRAULIC CONDUCTIVITY TEST) FOR COMPACTED CLAY LINER**

CLIENT: Terrapure Environmental  
 PROJECT: Stoney Creek Landfill - Phase 8A  
 LOCATION: Phase 8A  
 COMPONENT:  
 SET #: 2 - SCL  
 PERMEAMETER #: A2  
 NORTHING: 1354  
 EASTING: 1265

**STAGE 1 TEST CALCULATIONS (this table to be used only by staff experienced in this test)**

Input Parameters: Internal diameter of tube, d = 15 (mm)  
 Internal diameter of casing, D = 101 (mm)  
 Depth of casing base below ground, Z = 354 (mm)  
 Reference point of scale above ground, Ra = 150 (mm)  
 Depth of Clay Liner = 1000 (mm)

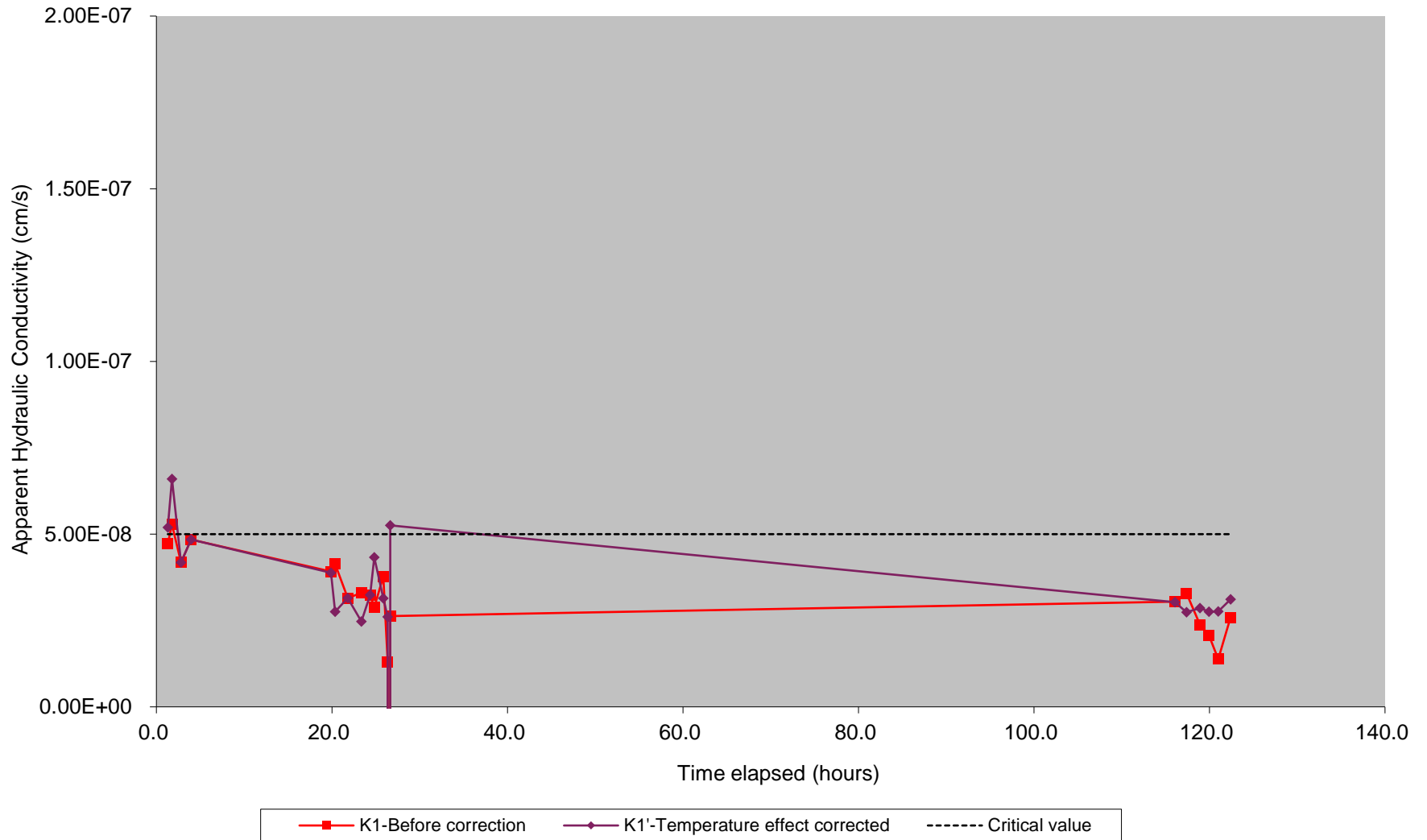
Calculated Parameters: Geometric Constant, G1 = 0.61136777 (in mm) for pervious lower boundary (a = -1)  
 Depth of Clay below bottom of casing, b1 = 646 (mm)  
 Head at time t, Ht = Ra + R + 20xD (all in mm)  
 H2' = H2 - c

Reading to be recorded in all rows:

1. Date, and time (in minutes)
2. R (in mm) = water level in standpipe above the reference point of scale for the given permeameter at time t
3. C (mm) = water level in standpipe above the reference point of scale for the Temperature Effect Gauge during time period t
4. Temperature and Remarks

Date	Time	Time lapsed (minutes)	R (mm)	H1 (mm)	H2 (mm)	K1 (cm/s)	C (mm)	c (mm)	H2' (mm)	K1' (cm/s)	Temperature (°C)	Cumulated time (hr)	Remarks
5-Oct-17	12:39	0	600	-	2770	-	600	0	-	-	20	0.0	
5-Oct-17	13:57	78	590	2770	2760	4.72E-08	601	1	2759	5.20E-08	21	1.3	
5-Oct-17	14:25	28	586	2760	2756	5.28E-08	602	1	2755	6.60E-08	21	1.8	Shelby tubes were collected nearby
5-Oct-17	15:27	62	579	2756	2749	4.18E-08	602	0	2749	4.18E-08	21	2.8	
5-Oct-17	16:36	69	570	2749	2740	4.84E-08	602	0	2740	4.84E-08	21	4.0	
6-Oct-17	8:33	957	471	2740	2641	3.92E-08	601	-1	2642	3.88E-08	16	19.9	
6-Oct-17	9:01	28	468	2641	2638	4.14E-08	600	-1	2639	2.76E-08	16	20.4	
6-Oct-17	10:27	86	461	2638	2631	3.15E-08	600	0	2631	3.15E-08	16	21.8	
6-Oct-17	12:01	94	453	2631	2623	3.30E-08	598	-2	2625	2.47E-08	16	23.4	
6-Oct-17	13:01	60	448	2623	2618	3.24E-08	598	0	2618	3.24E-08	17	24.4	
6-Oct-17	13:28	27	446	2618	2616	2.88E-08	599	1	2615	4.33E-08	18	24.8	
6-Oct-17	14:30	62	440	2616	2610	3.77E-08	598	-1	2611	3.14E-08	20	25.9	
6-Oct-17	15:00	30	439	2610	2609	1.30E-08	599	1	2608	2.60E-08	20	26.4	
6-Oct-17	15:04	4	600	2609	2770	-1.53E-05	599	0	2770	-1.53E-05	20	26.4	Refilled the permeameter
6-Oct-17	15:18	14	599	2770	2769	2.63E-08	600	1	2768	5.26E-08	20	26.7	
10-Oct-17	8:43	5365	189	2769	2359	3.04E-08	598	-2	2361	3.03E-08	15	116.1	
10-Oct-17	10:02	79	183	2359	2353	3.28E-08	597	-1	2354	2.74E-08	17	117.4	
10-Oct-17	11:33	91	178	2353	2348	2.38E-08	598	1	2347	2.86E-08	20	118.9	
10-Oct-17	12:36	63	175	2348	2345	2.07E-08	599	1	2344	2.76E-08	22	120.0	
10-Oct-17	13:39	63	173	2345	2343	1.38E-08	601	2	2341	2.76E-08	24	121.0	
10-Oct-17	15:03	84	168	2343	2338	2.59E-08	602	1	2337	3.11E-08	25	122.4	

Terrapure Environmental - Phase 8A  
Stoney Creek Landfill - Phase 8A  
Set 2 - SGL A2



# Appendix I

## Geomembrane Quality Assurance Program

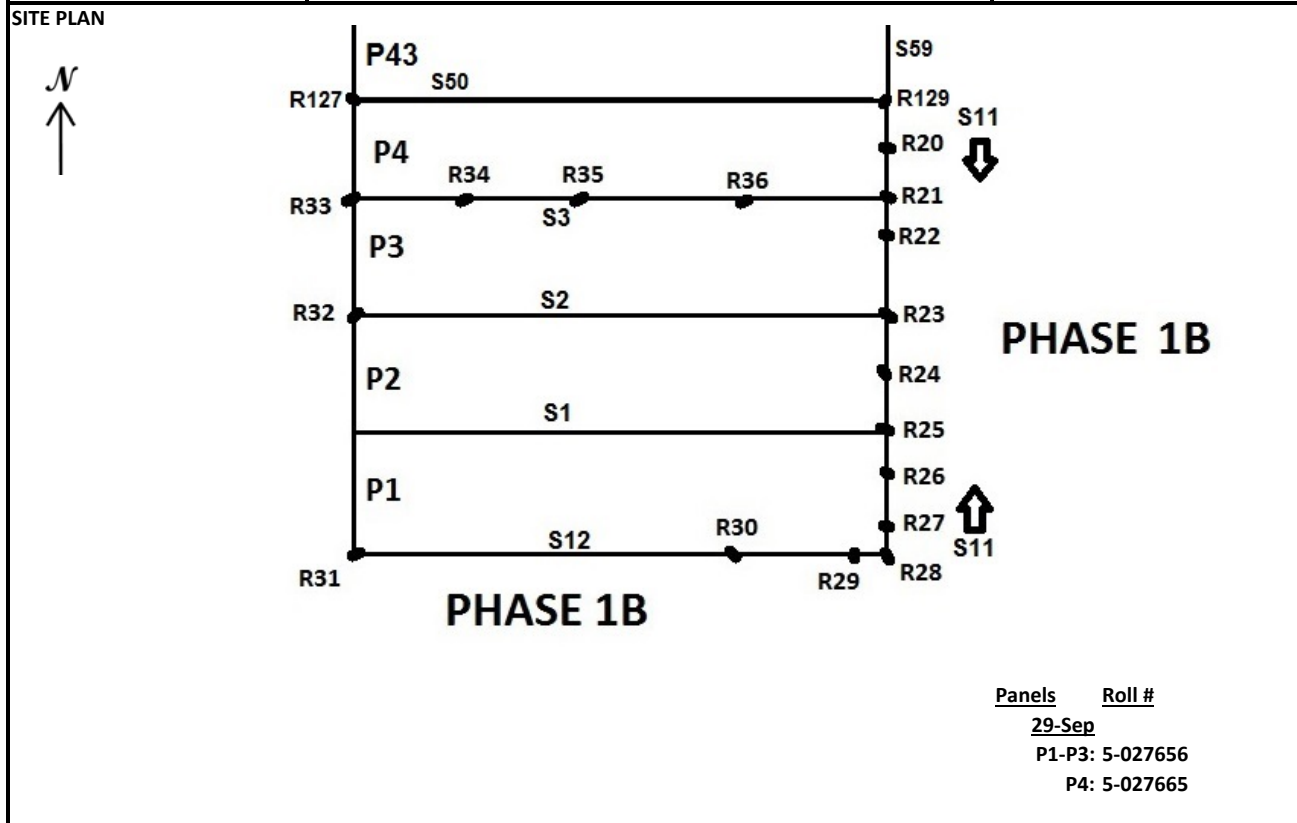
# Appendix I1

## 80 mil – Primary Liner

# Geomembrane Daily Inspection Report



<b>DATE:</b> 29 Sep 17	<b>PREPARED BY:</b> PL	<b>INSTALLERS:</b> Terrafix
<b>PROJECT:</b> Phase 8A	<b>TEMPERATURE AND WEATHER CONDITIONS</b> AM: 13 ° C, Cloudy PM: 14 ° C, Rain	
<b>CLIENT:</b> Terrapure Environmental	<b>WORK HOURS</b> START: 8:00 A.M. FINISH: 11:00 A.M.	<b>EQUIPMENT:</b> Merlo P38.13 Plus Zoom Boom Cat 245 G LC Excavator Generators

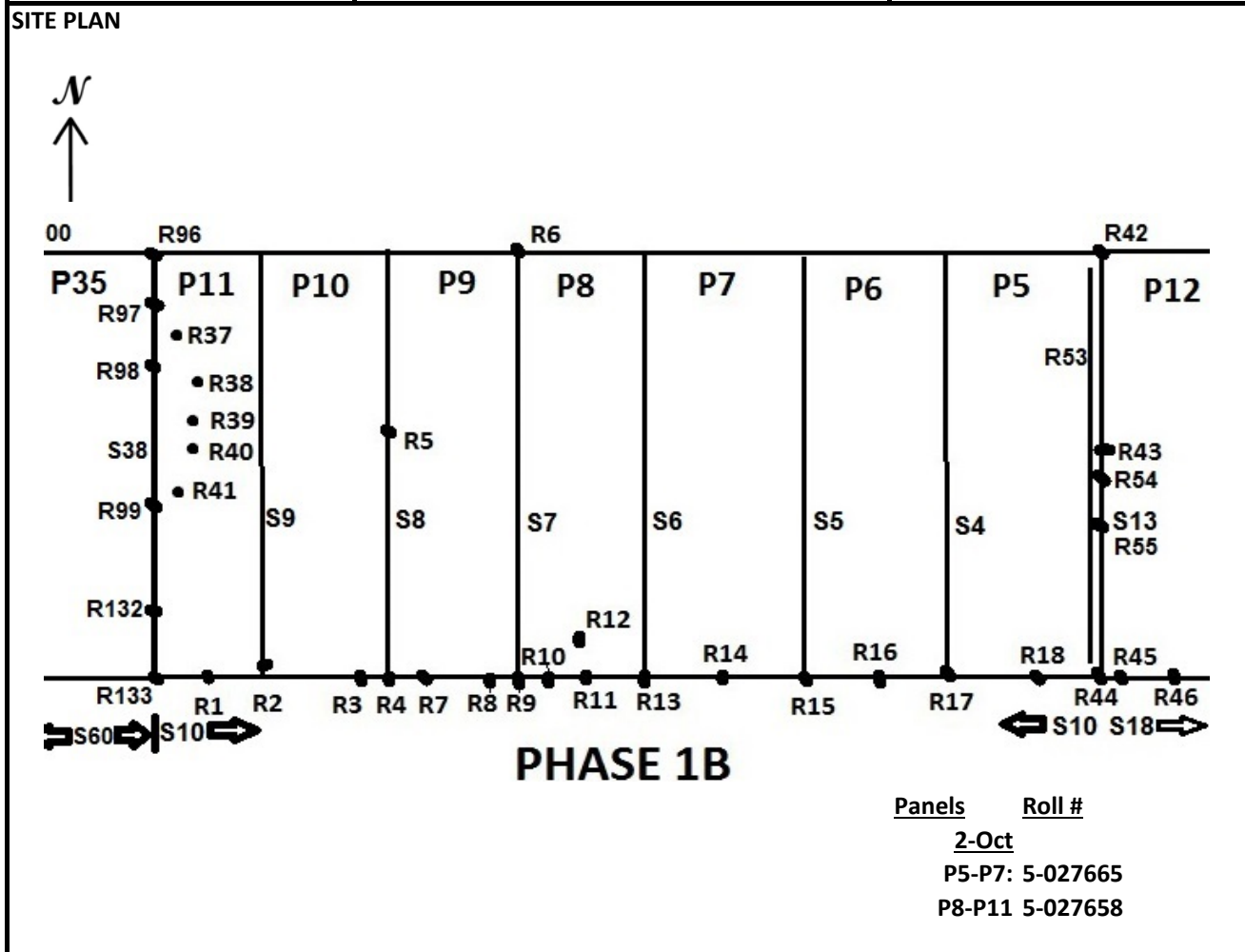


<b>GEOMEMBRANE QUANTITY</b>		<b>SEAM QUANTITY</b>	
Daily:	1,044 m <sup>2</sup>	Daily:	181 m
Cumulative:	1,044 m <sup>2</sup>	Cumulative:	181 m
<b>CALBRATING TESTS:</b>		<b>NON-DESTRUCTIVE TESTS</b>	
Fusion: CF1 (29 Sep), CF4 (3 Oct), CF5 (3 Oct)		Air Test: 2 - Seams (Sep 29), 13 - Seams (Oct 3)	
Extrusion: CE2 (3 Oct)		Vacuum Box: 17 - Repairs (Oct 3)	
<b>REPAIRS:</b>		<b>DESTRUCTIVE TESTS:</b>	
17 - R20 to R36 - All repairs completed 3 Oct 2017.		1 - DS2 (Oct 3)	
All test completed on 29 Sept 2017 and Oct 3 2017			
<b>NOTES:</b>			
Rain begun and work had to be stopped on 29 Sep			
3 Oct 17 - Work hours: 8:00 - 14:20; Temperature, and weather conditions: AM: 13° C, Clear sky; PM: 17° C, Clear sky			

# Geomembrane Daily Inspection Report



<b>DATE:</b> 2 Oct 17	<b>PREPARED BY:</b> PL	<b>INSTALLERS:</b> Terrafix
<b>PROJECT:</b> Phase 8A	<b>TEMPERATURE AND WEATHER CONDITIONS</b> AM: 10 ° C, Clear Sky PM: 16 ° C, Clear Sky	<b>EQUIPMENT:</b> Merlo P38.13 Plus Zoom Boom Cat 245 G LC Excavator Generators
<b>CLIENT:</b> Terrapure Environmental	<b>WORK HOURS</b> START: 8:00 A.M. FINISH: 3:00 P.M.	



<b>GEOMEMBRANE QUANTITY</b>	<b>SEAM QUANTITY</b>
Daily: 979 m <sup>2</sup>	Daily: 191 m
Cumulative: 2,024 m <sup>2</sup>	Cumulative: 372 m

<b>CALBRATING TESTS:</b>	<b>NON-DESTRUCTIVE TESTS</b>	<b>DESTRUCTIVE TESTS:</b>
Fusion: CF2, CF3	Air Test: 21 - Seams	1 - DS1
Extrusion: CE1	Vacuum Box: 19 - Repairs	

**REPAIRS:** 19 - All repairs completed on 2 Oct 17  
26 - All tests completed on 2 Oct 17

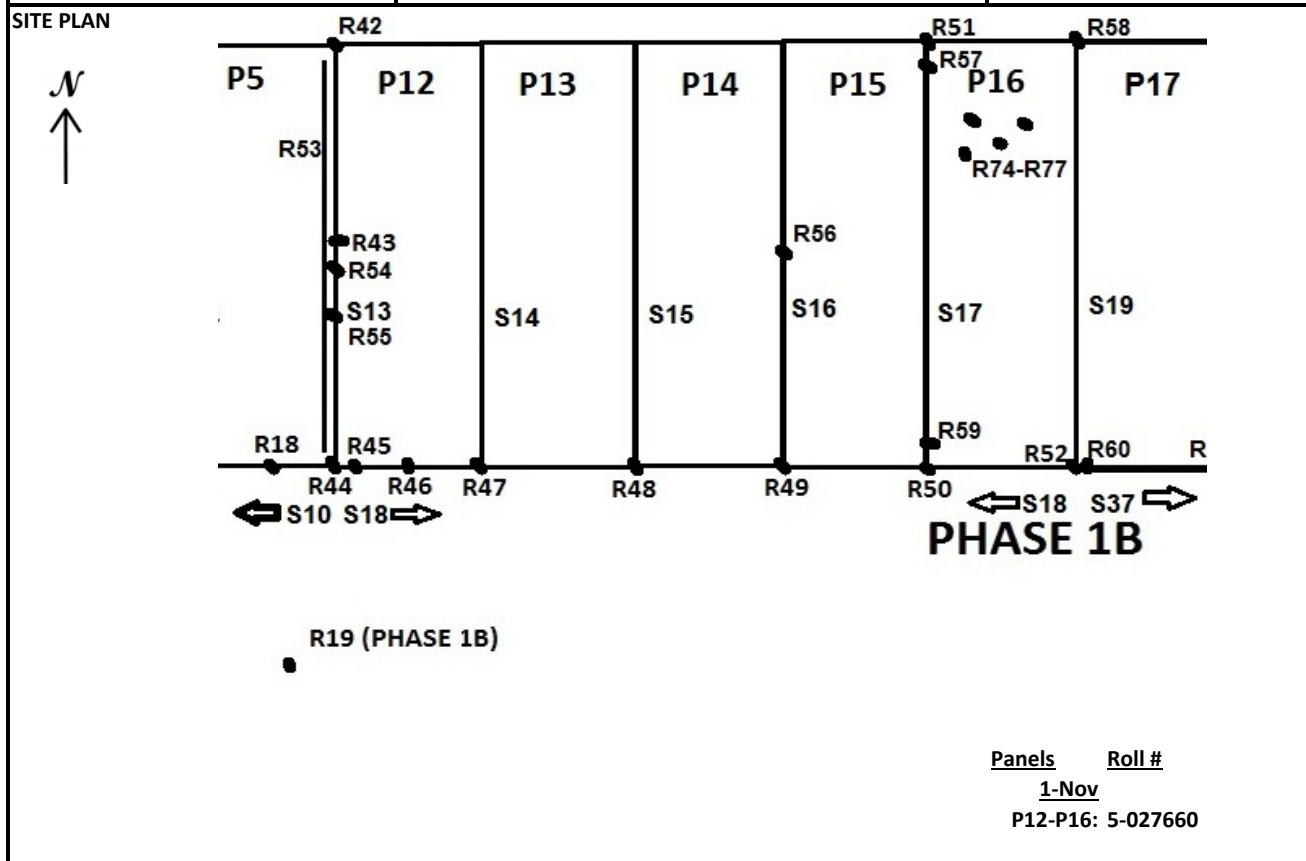
**NOTES:**



# Geomembrane Daily Inspection Report



<b>DATE:</b> 1 Nov 17	<b>PREPARED BY:</b> PL	<b>INSTALLERS:</b> Terrafix
<b>PROJECT:</b> Phase 8A	<b>TEMPERATURE AND WEATHER CONDITIONS</b> AM: 5 ° C, Cloudy      PM: 8 ° C, Cloudy	
<b>CLIENT:</b> Terrapure Environmental	<b>WORK HOURS</b> START: 10:00 A.M.      FINISH: 4:30 P.M.	<b>EQUIPMENT:</b> Merlo P38.13 Plus Zoom Boom Generators



<b>GEOMEMBRANE QUANTITY</b>	<b>SEAM QUANTITY</b>
Daily: 860 m <sup>2</sup>	Daily: 160 m
Cumulative: 2,884 m <sup>2</sup>	Cumulative: 532 m

<b>CALBRATING TESTS:</b> Fusion: CF6 (1 Nov 17), CF 7 (1 Nov 17), CF8 (1 Nov 17) Extrusion: CE4 (1 Nov 17), CE5 (9 Nov 17), CE7 (10 Nov 17)	<b>NON-DESTRUCTIVE TESTS</b> Air Test: 10 - Seams (9 Nov 17) Vacuum Box: 20 - Repairs (10 Nov 17)	<b>DESTRUCTIVE TESTS:</b> 1 - DS3 (9 Nov 17)
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**REPAIRS:** 11 - Repairs (R42 to R52) completed on 1 Nov 17. 6 - Repairs (R53 to R58) completed on 9 Nov 17.  
7 - Repairs (R59 to R61, R74 to R77) completed on 10 Nov 17.

**NOTES:** 9 Nov 17 - Work hours: 7:55 - 16:30; Temperature, and weather conditions: AM: 5° C, Sunny with some clouds; PM: 9° C, Cloudy  
10 Nov 17 - Work hours: 8:45 - 16:30; Temperature, and weather conditions: AM: -7° C, Sunny; PM: -5° C, Cloudy

# Geomembrane Daily Inspection Report



<b>DATE:</b> 9 Nov 17	<b>PREPARED BY:</b> PL	<b>INSTALLERS:</b> Terrafix
<b>PROJECT:</b> Phase 8A	<b>TEMPERATURE AND WEATHER CONDITIONS</b> AM: 5 ° C, Sunny with some clouds      PM: 9 ° C, Cloudy	
<b>CLIENT:</b> Terrapure Environmental	<b>WORK HOURS</b> START: 7:55 A.M.      FINISH: 4:30 P.M.	<b>EQUIPMENT:</b> Merlo P38.13 Plus Zoom Boom Generators Cat 245 G LC Excavator

**SITE PLAN**

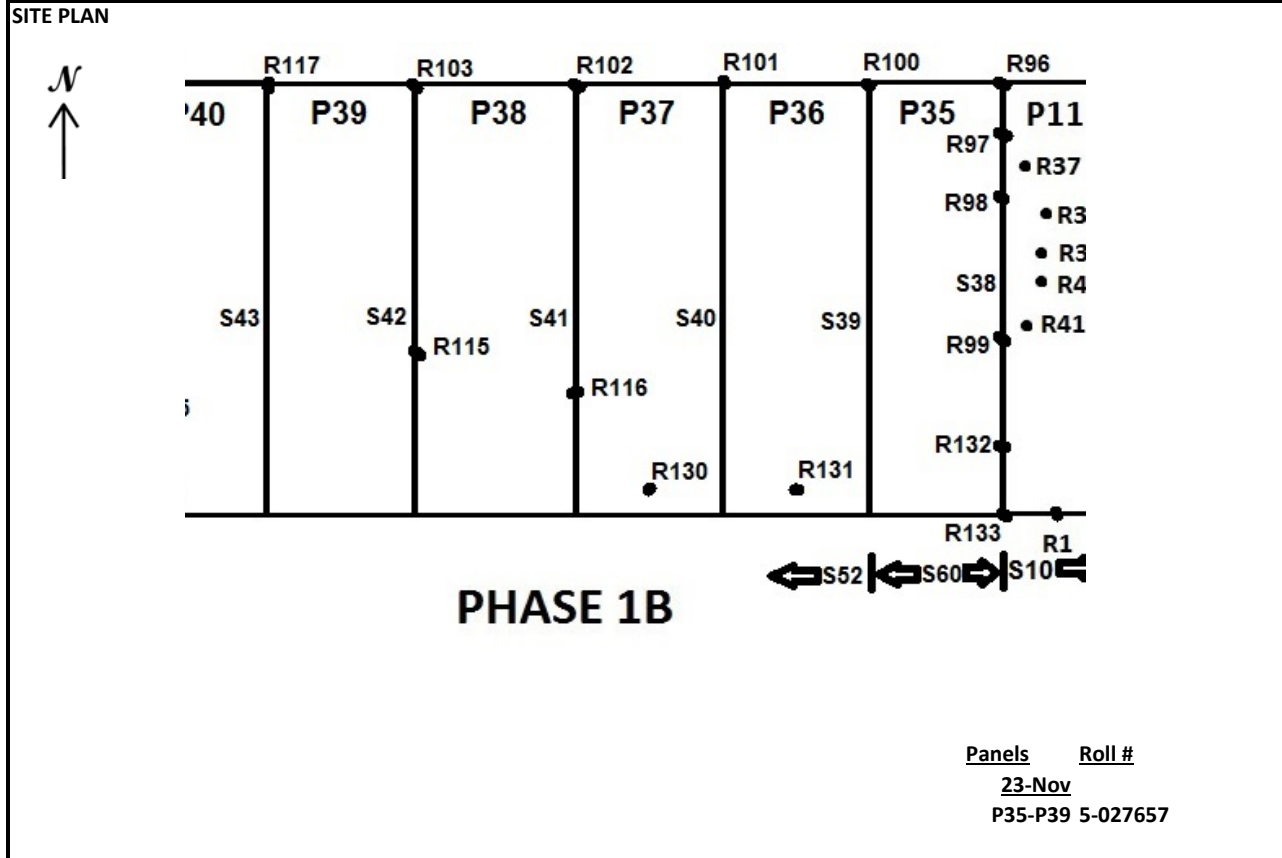
**Panels      Roll #**  
**9-Nov**  
**P17-P22: 5-027663**  
**P23-P26: 5-027659**  
**P27-P30: 5-027653**  
**P31-P34: 5-027661**

<b>GEOMEMBRANE QUANTITY</b>		<b>SEAM QUANTITY</b>	
Daily:	<b>2,883 m<sup>2</sup></b>	Daily:	<b>551 m</b>
Cumulative:	<b>5,767 m<sup>2</sup></b>	Cumulative:	<b>1,083 m</b>
<b>CALBRATING TESTS:</b>		<b>NON-DESTRUCTIVE TESTS</b>	<b>DESTRUCTIVE TESTS:</b>
Fusion: CF9 (9 Nov 17), CF10 (9 Nov 17), CF11 (9 Nov), CF12 (9 Nov 17), CF13 (10 Nov 17),		Air Test: 24 - Seams (9 Nov 17), 20 - Seams (10 Nov 17)	2 - DS4 and DS5 (10 Nov 17)
Extrusion: CE5 (9 Nov 17), CE6 (10 Nov 17), CE7 (10 Nov 17), CE8 (14 Nov 17)		Vacuum Box: 20 - Repairs (10 Nov 17), 16 - Repairs (14 Nov 17)	
<b>REPAIRS:</b> 1 - Repair (R58) completed on 9 Nov 17. 22 - Repairs (R60 to R81) completed on 10 Nov 17. 14 - Repairs (R82 to R95) completed on 14 Nov 17.			
<b>NOTES:</b> 10 Nov 17 - Work hours: 8:45 - 16:30; Temperature, and weather conditions: AM: -7° C, Sunny; PM: -5° C, Cloudy 14 Nov 17 - Work hours: 8:00 - 12:00; Temperature, and weather conditions: AM: 2° C, Cloudy; PM: 6° C, Cloudy			

# Geomembrane Daily Inspection Report



<b>DATE:</b> 23 Nov 17	<b>PREPARED BY:</b> PL	<b>INSTALLERS:</b> Terrafix
<b>PROJECT:</b> Phase 8A	<b>TEMPERATURE AND WEATHER CONDITIONS</b>	
	<b>AM:</b> 3 ° C, Cloudy	<b>PM:</b> 5 ° C, Cloudy
<b>CLIENT:</b> Terrapure Environmental	<b>WORK HOURS</b>	<b>EQUIPMENT:</b>
	<b>START:</b> 11:00 A.M.	<b>FINISH:</b> 4:00 P.M.
		Merlo P38.13 Plus Zoom Boom Generators Cat 470G LC Excavator



<b>GEOMEMBRANE QUANTITY</b>		<b>SEAM QUANTITY</b>	
Daily:	<b>806 m<sup>2</sup></b>	Daily:	<b>153 m</b>
Cumulative:	<b>6,573 m<sup>2</sup></b>	Cumulative:	<b>1,235 m</b>
<b>CALBRATING TESTS:</b>		<b>NON-DESTRUCTIVE TESTS</b>	
Fusion: CF14 (23 Nov 17), CF15 (24 Nov 17)		Air Test: 5 - Seams (25 Nov 17)	
Extrusion: CE11 (24 Nov 17), CE13 (27 Nov 17)		Vacuum Box: 1 - Seams (25 Nov 17), 1 - Seams (27 Nov 17), 8 - Repairs (25 Nov 17), 7 - Repairs (27 Nov 17)	
<b>REPAIRS:</b> 8 - Repair (R96 to R103) completed on 24 Nov 17. 2 - Repairs (R115 to R116) completed on 25 Nov 17. 5 - Repairs (R117, R130 to R133) completed on 27 Nov 17.		<b>DESTRUCTIVE TESTS:</b> 1 - DS8 (25 Nov 17)	
<b>NOTES:</b>			
24 Nov 17 - Work hours: 8:00 - 16:45; Temperature, and weather conditions: AM: 1° C, Sunny; PM: 10° C, Sunny			
25 Nov 17 - Work hours: 8:00 - 16:30; Temperature, and weather conditions: AM: 6° C, Cloudy PM: 9° C, Cloudy			
27 Nov 17 - Work hours: 9:00 - 17:45; Temperature, and weather conditions: AM: 1° C, Sunny with some clouds; PM: 3° C, Sunny with some clouds			

# Geomembrane Daily Inspection Report



<b>DATE:</b> 24 Nov 17	<b>PREPARED BY:</b> PL	<b>INSTALLERS:</b> Terrafix
<b>PROJECT:</b> Phase 8A	<b>TEMPERATURE AND WEATHER CONDITIONS</b> AM: 1 ° C, Clear sky      PM: 10 ° C, Sunny with clouds	
<b>CLIENT:</b> Terrapure Environmental	<b>WORK HOURS</b> START: 8:00 A.M.      FINISH: 4:45 P.M.	<b>EQUIPMENT:</b> Merlo P38.13 Plus Zoom Boom Generators Cat 245 G LC Excavator

**SITE PLAN**

**PHASE 1B**

Panels	Roll #
	<b>24-Nov</b>
P40-P42, P46, P47:	5-027654
P43-P45:	5-027664
P48-P50:	5-027655

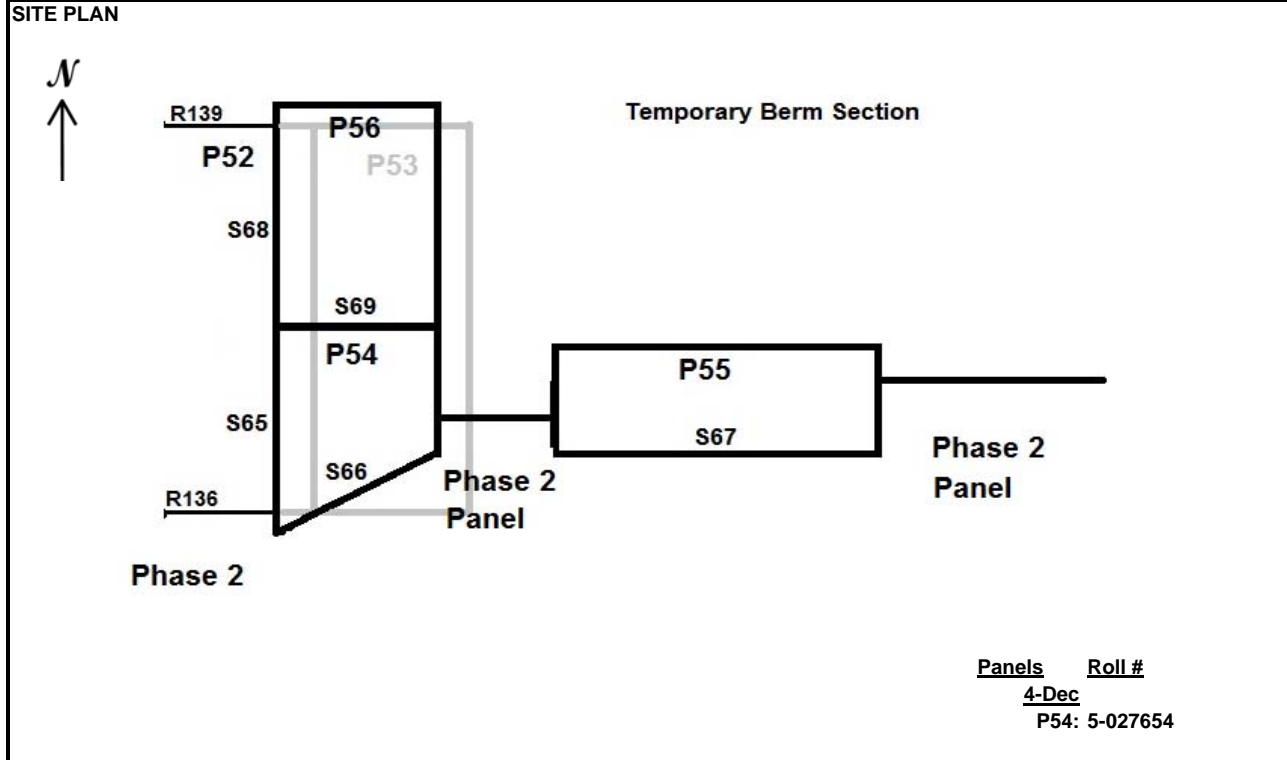
<b>GEOMEMBRANE QUANTITY</b>		<b>SEAM QUANTITY</b>	
Daily:	1,772 m <sup>2</sup>	Daily:	306 m
Cumulative:	8,345 m <sup>2</sup>	Cumulative:	1,542 m
<b>CALBRATING TESTS:</b>	<b>NON-DESTRUCTIVE TESTS</b>	<b>DESTRUCTIVE TESTS:</b>	
Fusion: CF16 (24 Nov 17), CF17 (24 Nov 17), CF18 (25 Nov 17)	Air Test: 11 - Seams (25 Nov 17), 6 - Seams (27 Nov 17)	2 - DS6 and DS7 (25 Nov 17)	
Extrusion: CE11 (24 Nov 17), CE13 (27 Nov 17)	Vacuum Box: 6 - Repairs (25 Nov 17), 18 - Repairs (27 Nov 17), 1 - Seams (25 Nov 17), 1 - Seams (27 Nov 17)		
<b>REPAIRS:</b> 2 - Repair (R104, R105) completed on 24 Nov 17. 9 - Repairs (R106 to R114) completed on 25 Nov 17. 13 - Repairs (R117 to R129) completed on 27 Nov 17.			
<b>NOTES:</b> 25 Nov 17 - Work hours: 8:00 - 16:30; Temperature, and weather conditions: AM: 6° C, Cloudy PM: 9° C, Cloudy 27 Nov 17 - Work hours: 9:00 - 17:45; Temperature, and weather conditions: AM: 1° C, Sunny with some clouds; PM: 3° C, Sunny with some clouds			



# Geomembrane Daily Inspection Report



<b>DATE:</b> 4 Dec 17	<b>PREPARED BY:</b> PL	<b>INSTALLERS:</b> Terrafix
<b>PROJECT:</b> Phase 8A	<b>TEMPERATURE AND WEATHER CONDITIONS</b>	
	<b>AM:</b> -	<b>PM:</b> 5 ° C, Cloudy
<b>CLIENT:</b> Terrapure Environmental	<b>WORK HOURS</b>	<b>EQUIPMENT:</b> Merlo P38.13 Plus Zoom Boom Generators
	<b>START:</b> 1:30 P.M.	<b>FINISH:</b> 4:45 P.M.



<b>GEOMEMBRANE QUANTITY</b>		<b>SEAM QUANTITY</b>	
Daily:	143 m <sup>2</sup>	Daily:	26 m
Cumulative:	9,111 m <sup>2</sup>	Cumulative:	1,679 m

<b>CALBRATING TESTS:</b>	<b>NON-DESTRUCTIVE TESTS</b>	<b>DESTRUCTIVE TESTS:</b>
Fusion: none	Air Test: none	none
Extrusion: CE16	Vacuum Box: 2 - Seams	

**REPAIRS:** none

**NOTES:**

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# Geomembrane Daily Inspection Report



DATE: 6 Dec 17		PREPARED BY: PL	INSTALLERS: Terrafix
PROJECT:	Phase 8A	TEMPERATURE AND WEATHER CONDITIONS AM: 2° C, Clear Sky                      PM: 4° C, Clear Sky	
CLIENT:	Terrapure Environmental	WORK HOURS START: 10:30 A.M.	FINISH: 1:00 P.M.
		EQUIPMENT: Merlo P38.13 Plus Zoom Boom Generators Polaris ATV	

**SITE PLAN**

Panels            Roll #  
**30-Nov**  
 P55: 460 Solmax 2-063597  
 P56: 480 Solmax 2-064415

<b>GEOMEMBRANE QUANTITY</b>		<b>SEAM QUANTITY</b>	
Daily:	<b>190 m<sup>2</sup></b>	Daily:	<b>35 m</b>
Cumulative:	<b>9,301 m<sup>2</sup></b>	Cumulative:	<b>1,714 m</b>

<b>CALBRATING TESTS:</b>	<b>NON-DESTRUCTIVE TESTS</b>	<b>DESTRUCTIVE TESTS:</b>
Fusion: none	Air Test: none	none
Extrusion: CE17	Vacuum Box: 3 - Seams	

REPAIRS: none

NOTES:

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# Instrument Calibration - Fusion Welder



Project: Phase 8A  
 Client: Terrapure Environmental  
 Prepared By: PL

Test Number	CF 1	CF 2	CF 3	CF 4	CF 5	CF 6	CF 7	CF 8	CF 9	CF 10
Date	29-Sep-17	2-Oct-17	2-Oct-17	3-Oct-17	3-Oct-17	1-Nov-17	1-Nov-17	1-Nov-17	9-Nov-17	9-Nov-17
Time	8:42	7:48	10:10	8:40	8:45	9:45	11:45	14:38	7:55	10:05
Air Temperature (°C)	13	10	13	13	13	5	6	8	5	5
Instrument Number	W3-99	W3-99	W3-99	W3-99	W3-99	W5-2	W5-2	W5-2	W-88	0.3T
Instrument Temperature (°F)	800	800	800	800	800	825	825	825	800	800
Instrument Speed (ft/s)	5.5	6	6	6	6	7	7	6	5.5	6.5
Name of Welding Technician	JB	JB	JB	TG	TG	EH	EH	EH	TG	NK
Notes				Smooth (Phase 1B) / Textured (Phase 8A)	Textured (Phase 1B) / Textured (Phase 8A)			Smooth (Phase 1B) / Textured (Phase 8A)		
<b>PEEL SPECIFICATIONS</b> 80 mil - 22 kN/m (Hot Wedge Seam) - 126 lbs/in (Hot Wedge Seam)										
Peel Resistance (lbs/in)	146/172	162/160	158/171	151/157	189/177	143/134	135/172	191/187	148/126	174/162
	147/163	166/145	158/154	130/163	173/173	148/131	153/170	178/198	130/143	162/170
	164/174	155/152	176/158	143/144	173/196	128/131	172/169	201/194	135/140	176/164
	159/144	159/170	186/168	155/125	174/185	149/131	174/171	190/199	140/129	171/162
	150/162	166/155	167/166	127/129	207/161	130/132	175/173	194/202	132/127	156/166
Type of Rupture	SE3	SE3	SE3	SE3	SE3	SE3	SE3	SE3	SE3	SE3
<b>SHEAR SPECIFICATIONS</b> 80 mil - 28 kN/m - 160 lbs/in										
Shear Resistance (lbs/in)	231	239	204	155	236	184	239 SE1	250	178	263
	234	237	196	161	234	177	241	245	192	264
	236	238	202	159	243	191	245	244	189	254
	233	243	196	158	238	179	256	242	195	251
	231	240	198	156	216	181	241 SE1	254	202	254
Type of Rupture	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	SE1

All fusion welding was 80 mil on 80 mil geomembrane. Generally the calibrations are smooth on smooth welded unless noted otherwise.

Notes:

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# Instrument Calibration - Fusion Welder



Project: Phase 8A  
 Client: Terrapure Environmental  
 Prepared By: PL

Test Number	CF 11	CF 12	CF 13	CF 14	CF 15	CF 16	CF 17	CF 18	CF 19	CF 20
Date	9-Nov-17	9-Nov-17	10-Nov-17	23-Nov-17	24-Nov-17	24-Nov-17	24-Nov-17	25-Nov-17	30-Nov-17	30-Nov-17
Time	11:15	13:10	8:35	12:30	8:00	9:22	10:45	10:50	8:55	8:32
Air Temperature (°C)	6	9	-7	3	2	2	7	8	1	1
Instrument Number	0.5T	W-88	W-88	W 9-0	N-2	N-2	N-2	W17	N-2	N-2
Instrument Temperature (°F)	800	800	800	800	817	817	825	825	825	825
Instrument Speed (ft/s)	6.5	5.5	5.5	3.0	6.9	7.0	5.0	5.5	5	5
Name of Welding Technician	NK	TG	TG	JP	JR	JR	JR	JR	JR	JR
Notes			Smooth (Phase 2) / Textured (Phase 8A)							Smooth (Phase 2) / Textured (Phase 8A)
<b>PEEL SPECIFICATIONS</b> 80 mil - 22 kN/m (Hot Wedge Seam) - 126 lbs/in (Hot Wedge Seam)										
Peel Resistance (lbs/in)	147/171	168/151	156/191	198/192	185/171	164/160	152/166	178/190	155/178	164/178
	172/158	172/154	146/202	212/218	165/178	174/165	160/167	205/181	166/179	202/170
	157/160	175/162	198/198	208/215	174/178	168/158	153/160	183/178	167/153	154/198
	163/170	160/154	207/202	196/223	189/189	147/156	142/165	186/194	173/181	180/171
	166/175	166/155	213/164	208/210	191/164	170/150	140/166	179/185	158/190	170/165
Type of Rupture	SE3	SE3	SE3	SE3	SE3	SE3	SE3	SE3	SE3	SE3
<b>SHEAR SPECIFICATIONS</b> 80 mil - 28 kN/m - 160 lbs/in										
Shear Resistance (lbs/in)	223	237	315	310	265	272	256	250	276	263
	232	254	311	290	240	273	257	267	279	265
	225	245	309	289	291	272	249	270	280	270
	236	257	327	286	294	265	256	264	281	269
	235	251	309	290	290	270	238	269	281	280
Type of Rupture	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1	ALL	ALL

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Instrument Calibration - Extrusion Welder



**Project:** Phase 8A  
**Client:** Terrapure  
 Environmental  
**Prepared By:** PL

Test Number	CE1	CE2	CE3	CE4	CE5	CE6	CE7	CE8	CE9
Date	2-Oct-17	3-Oct-17	17-Oct-17	1-Nov-17	9-Nov-17	10-Nov-17	10-Nov-17	14-Nov-17	24-Nov-17
Time	12:05	10:50	9:30	15:00	13:27	14:17	14:33	8:00	8:00
Air Temperature (°C)	16	17	10	8	9	-5	-5	2	2
Instrument Number	Ex 8	Ex 8	EX 5 - 1	EX - 75	EX 6	EX 15	EX 6	EX 15	EX 6
Pre-Heat Temperature (°F)	525	525	530	520	525	550	550	515	515
Barrel Temperature (°F)	525	525	530	525	525	525	535	525	510
Name of Welding Technician	JB	JB	NB	JB	LO	BK	JB	NB	NB
<b>PEEL SPECIFICATIONS</b>									
80 mil - 19 kN/m (Extrusion Seam) - 109 lbs/in (Extrusion Seam)									
Peel Resistance (lbs/in)	131	150	192	155	130	143	123	148	160
	150	165	167	151	159	128	117	152	140
	147	159	164	191	165	119	126	148	171
	155	160	166	163	146	186	154	151	112
	127	145	189	180	153	167	145	153	125
Type of Rupture	SE3	SE3	SE3	SE3	SE3	SE3	SE3	SE3	SE3
<b>SHEAR SPECIFICATIONS</b>									
80 mil - 28 kN/m - 160 lbs/in									
Shear Resistance (lbs/in)	176	195	238	252	265	276	285	243	267
	172	192	250	259	247	299	301	241	267
	182	184	220	248	253	294	305	239	272
	181	188	259	257	246	295	396	253	266
	185	187	245	253	241	260	301	255	266
Type of Rupture	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1

**Notes:** The extrusion calibration coupons correspond with the material that was being extrusion welded.  
 i.e. Smooth on smooth or smooth on textured. All coupons were 80 mil on 80 mil unless noted otherwise.

# Instrument Calibration - Extrusion Welder



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Test Number	CE10	CE11	CE12	CE13	CE14	CE15	CE16	CE17
Date	24-Nov-17	24-Nov-17	25-Nov-17	27-Nov-17	27-Nov-17	30-Nov-17	4-Dec-17	6-Dec-17
Time	13:52	13:30	9:55	8:00	15:30	10:46	15:25	11:20
Air Temperature (°C)	9	9	8	1	3	2	5	2
Instrument Number	EX 6	EX 6	EX 6	EX 6	EX 6	EX 6	EX 6	EX 6
Pre-Heat Temperature (°F)	515	515	515	515	515	515	515	535
Barrel Temperature (°F)	510	510	510	510	510	510	525	525
Name of Welding Technician	NB	NB	NB	NB	NB	NB	NB	NB
<b>PEEL SPECIFICATIONS</b>								
80 mil - 19 kN/m (Extrusion Seam) - 109 lbs/in (Extrusion Seam)								
Peel Resistance (lbs/in)	175	194	152	109	135	143	142	137
	177	182	165	113	141	156	142	150
	194	181	180	115	138	142	147	135
	193	186	198	109	140	156	130	126
	185	196	199	111	144	153	133	138
Type of Rupture	SE3	SE3	SE3	SE3	SE3	SE3	SE3	SE3
<b>SHEAR SPECIFICATIONS</b>								
80 mil - 28 kN/m - 160 lbs/in								
Shear Resistance (lbs/in)	269	252	246	246	245	240	222	175
	259	261	247	258	246	238	234	183
	265	252	260	248	250	245	220	188
	264	250	252	233	244	243	235	189
	267	255	242	239	248	243	232	187
Type of Rupture	SE1	SE1	SE1	SE1	SE1	ALL	SE1	SE1

Notes: CE 17: welded 60 mil to 60 mil geomembrane

# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	S1	S2	S3		S4	S5	S6
Upstream Membrane	P2	P3	P4		P5	P6	P7
Downstream Membrane	P1	P2	P3		P6	P7	P8
Date	29-Sep-17	29-Sep-17	29-Sep-17		2-Oct-17	2-Oct-17	2-Oct-17
Starting Time	9:05	9:40	10:23		8:15	8:38	9:00
Length (m)	38	38	38		24	24	24
Calibrating Number	CF1	CF1	CF1		CF2	CF2	CF2
Non-destructive Tests (AIR/VBOX)	AIR	AIR	AIR		AIR	AIR	AIR
Date	29-Sep-17	29-Sep-17	3-Oct-17		2-Oct-17	2-Oct-17	2-Oct-17
Time	9:47	10:26	9:50	11:22	8:50	9:01	9:24
Results	49/49	45/45	43/43	40/40	38/38	39/38	40/37
			11:22	11:30			
			42/42	41/41			

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	S7	S8	S9	S10			
Upstream Membrane	P9	P10	P11	P5 - P11			
Downstream Membrane	P8	P9	P10	Phase 1B			
Date	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17			
Starting Time	9:17	9:30	9:55	10:55			
Length (m)	24	24	24	47			
Calibrating Number	CF2	CF2	CF2	CF3			
Non-destructive Tests (AIR/VBOX)	AIR	AIR	AIR	AIR			
Date	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17			
Time	9:44	10:55	11:24	11:15	11:24	11:51	13:14
Results	42/39	45/45	45/44	44/42	45/45	40/39	42/42
		11:41		11:18	11:41	11:51	13:14
		39/38		46/46	36/35	37/37	42/42

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number				S11			
Upstream Membrane				P1 -P4			
Downstream Membrane				Phase 1B			
Date				3-Oct-17			
Starting Time				9:03			
Length (m)				27			
Calibrating Number				CF4			
Non-destructive Tests (AIR/VBOX)				AIR			
Date				3-Oct-17			
Time	13:22	13:28	13:37	9:50	9:57	10:08	10:20
Results	45/44	45/45	45/44	45/45	44/44	38/37	37/37
	13:22	13:28	13:37	9:57	10:08	10:20	
	56/55	42//41	36/36	42/42	36/35	37/37	

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	S12	S13	S14	S15	S16	S17	S18
Upstream Membrane	P1	P5	P12	P13	P14	P15	P12 -P16
Downstream Membrane	Phase 1B	P12	P13	P14	P15	P16	1B
Date	3-Oct-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17
Starting Time	9:45	11:15	12:13	12:31	12:49	13:05	15:15
Length (m)	48	25.3	25.3	25.3	25.3	25.3	33.5
Calibrating Number	CF5	CF6	CF7	CF7	CF7	CF7	CF8
Non-destructive Tests (AIR/VBOX)	AIR	AIR	AIR	AIR	AIR	AIR	AIR
Date	3-Oct-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17
Time	10:43	-	9:05	9:28	9:28	10:51	9:14
Results	38/38	-	49/49	44/43	49/48	42/42	43/43
	10:41						9:14
	37/37						41/41

Notes: S13 did not pass. Seam will be fixed with extrusion, see repair R53

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# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number			S19	S20	S21	S22	
Upstream Membrane			P16	P17	P21	P18/P19	
Downstream Membrane			P17	P18	P20	P21	
Date			9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	
Starting Time			8:36	8:58	9:29	10:00	
Length (m)			23	23	4	23	
Calibrating Number			CF9	CF9	CF9	CF9	
Non-destructive Tests (AIR/VBOX)			AIR	AIR	AIR	AIR	
Date			9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	
Time	9:14	9:39	11:24	11:24	11:32	11:32	12:54
Results	47/44	50/48	47/46	53/52	49/48	55/54	47/46
	9:28	9:39				11:49	
	51/48	52/51				56/56	

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	S23	S24	S25	S26	S27	S28	S29
Upstream Membrane	P20/P21	P19	P22	P23	P24	P25	P26
Downstream Membrane	P19	P22	P23	P24	P25	P26	P27
Date	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17
Starting Time	9:38	10:27	10:52	10:40	11:26	11:40	13:00
Length (m)	15	27	27	27	27	27	27
Calibrating Number	CF9	CF9	CF9	CF10/CF11	CF9	CF11	CF11
Non-destructive Tests (AIR/VBOX)	AIR	AIR	AIR	AIR	AIR	AIR	AIR
Date	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17
Time	11:39	12:56	13:52	13:51	14:14	14:27	14:27
Results	52/51	56/55	53/52	48/47	44/43	51/51	44/44
	11:39		13:42	13:51	14:14		
	49/48		51/50	48/47	55/54		

Notes: \_\_\_\_\_ CF10 broke down  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	S30	S31	S32	S33	S34	S35	S36
Upstream Membrane	P27	P28	P29	P30	P31	P32	P33
Downstream Membrane	P28	P29	P30	P31	P32	P33	P34
Date	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17
Starting Time	13:30	13:25	13:50	13:55	14:12	14:50	2:55
Length (m)	27	27	27	27	27	27	27
Calibrating Number	CF11	CF12	CF11	CF12	CF11	CF12	CF12
Non-destructive Tests (AIR/VBOX)	AIR	AIR	AIR	AIR	AIR	AIR	AIR
Date	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17
Time	14:40	14:40	14:51	14:51	15:08	15:08	51/51
Results	46/45	45/44	45/43	51/50	43/42	52/52	15:18

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	S37						
Upstream Membrane	P17-P34						
Downstream Membrane	PHASE 2						
Date	10-Nov-17						
Starting Time	9:01						
Length (m)	112						
Calibrating Number	CF13						
Non-destructive Tests (AIR/VBOX)	AIR						
Date	10-Nov-17						
Time	13:34	13:46	13:57	14:10	14:48	15:08	15:39
Results	47/46	42/41	45/43	40/39	45/44	47/46	46/45
	13:34	13:45	14:01	14:10	15:08	15:35	15:41
	43/43	42/41	42/41	47/46	48/47	49/49	46/45

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number				S38	S39	S40	S41
Upstream Membrane				P35	P36	P37	P38
Downstream Membrane				P11	P35	P36	P37
Date				23-Nov-17	23-Nov-17	23-Nov-17	23-Nov-17
Starting Time				13:45	13:24	14:37	15:01
Length (m)				23.7	23.7	23.7	23.7
Calibrating Number				CF 14	CF 14	CF 14	CF 14
Non-destructive Tests (AIR/VBOX)				AIR	AIR	AIR	AIR
Date				25-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17
Time	16:38	14:19	14:30	12:50	11:50	9:40	9:10
Results	48/47	47/45	48/48	35/34	38/36	34/33	33/32
	14:19	14:27	14:39				9:16
	47/47	46/46	47/47				32/31

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	S42	S43	S44		S45	S46	S47
Upstream Membrane	P39	P40	P41		P42	P44	P45
Downstream Membrane	P38	P39	P40		P41	P43	P44
Date	24-Nov-17	24-Nov-17	24-Nov-17		24-Nov-17	24-Nov-17	24-Nov-17
Starting Time	8:30	9:09	10:08		11:09	12:18	13:00
Length (m)	23.7	23.7	27.7		12	38.4	38.4
Calibrating Number	CF 15	CF 16	CF 16		CF 17	CF 17	CF 17
Non-destructive Tests (AIR/VBOX)	AIR	AIR	AIR		AIR	AIR	AIR
Date	25-Nov-17	25-Nov-17	25-Nov-17	27-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17
Time	9:40	10:36	10:36	9:24	11:32	11:30	11:50
Results	35/34	30/29	30/30	32/31	30/30	33/33	40/40

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	S48	S49	S50	S51	S52	S53	S54
Upstream Membrane	P46	P47	P43	P45/P44	P36-P41	P48	P49
Downstream Membrane	P45	P46	P4	P41	1B	P42	P48
Date	24-Nov-17	24-Nov-17	24-Nov-17	24-Nov-17	24-Nov-17	24-Nov-17	24-Nov-17
Starting Time	13:32	13:47	14:17	14:55	13:45	15:42	15:51
Length (m)	20.5	16	38.4	11	41	12	12
Calibrating Number	CF 17	CF 17	CF 17	CF 17	CE 11	CF 17	CF 17
Non-destructive Tests (AIR/VBOX)	AIR	AIR	AIR	AIR	VBOX	AIR	AIR
Date	25-Nov-17	27-Nov-17	25-Nov-17	27-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17
Time	14:02	9:45	14:00	11:50	13:30	13:20	13:50
Results	30/29	35/33	35/34	40/40	OK	32/31	30/30

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	S55	S56	S57	S58	S59	S60	S61
Upstream Membrane	P50	P42/P48/P49	P46	P47	P43/P44	P35	P52
Downstream Membrane	P49	P45	P49	P50	1B	1B	P53
Date	24-Nov-17	24-Nov-17	25-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	30-Nov-17
Starting Time	16:01	16:21	12:15	12:30	12:00	16:46	8:40
Length (m)	10	16.5	2	7	11.3	6.7	30.5
Calibrating Number	CF 17	CF 17	CF 18	CF 18	CE 13	CE 13	CF 19
Non-destructive Tests (AIR/VBOX)	AIR	AIR	AIR	AIR	VBOX	VBOX	AIR
Date	27-Nov-17	25-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	30-Nov-17
Time	9:30	13:30	13:55	11:19	15:55	17:00	11:10
Results	33/33	30/30	33/32	33/32	OK	OK	32/31
		14:10					
		30/29					

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	S62	S63	S64		S65	S66	S67
Upstream Membrane	P34	P51	P51-P53		P52	P54	P53
Downstream Membrane	P51	P52	Phase 2		P54	1B	1B
Date	30-Nov-17	30-Nov-17	30-Nov-17		4-Dec-17	4-Dec-17	6-Dec-17
Starting Time	9:07	9:39	10:20		15:35	16:00	11:30
Length (m)	30.6	30.5	20.0		21.0	5.3	18.5
Calibrating Number	CF 19	CF 19	CF20		CE 16	CE 16	CE 17
Non-destructive Tests (AIR/VBOX)	AIR	AIR	AIR		VBOX	VBOX	VBOX
Date	30-Nov-17	30-Nov-17	30-Nov-17		4-Dec-17	4-Dec-17	6-Dec-17
Time	11:16	11:16	11:10	11:13	16:30	16:38	AM
Results	34/33	32/32	33/33	40/40	OK	OK	OK
			11:10				
			35/34				

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



# Seams

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



<b>Weld Number</b>	<b>S68</b>	<b>S69</b>
<b>Upstream Membrane</b>	<b>P52</b>	<b>P56</b>
<b>Downstream Membrane</b>	<b>P56</b>	<b>P54</b>
<b>Date</b>	<b>6-Dec-17</b>	<b>6-Dec-17</b>
<b>Starting Time</b>	<b>12:00</b>	<b>12:30</b>
<b>Length (m)</b>	<b>9.5</b>	<b>6.8</b>
<b>Calibrating Number</b>	<b>CE 17</b>	<b>CE 17</b>
<b>Non-destructive Tests (AIR/VBOX)</b>	<b>VBOX</b>	<b>VBOX</b>
<b>Date</b>	<b>6-Dec-17</b>	<b>6-Dec-17</b>
<b>Time</b>	<b>PM</b>	<b>PM</b>
<b>Results</b>	<b>OK</b>	<b>OK</b>

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R1	R2	R3	R4	R5	R6
Location	1B/1B/P11	1B/P10/P11	1B/1B/P10	1B/P10/P9	P9/P10	P8/P9
Date	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17
Time	13:09	13:20	13:25	13:27	13:41	13:59
Calibrating Number	CE 1	CE 1	CE 1	CE 1	CE 1	CE 1
Dimensions (m)	.3 X .7	1.5 X .75	.3 X .7	.3 X .7	1.5 X .75	1.5 X .75
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Tee Junction	Tee Junction	Tee Junction	Tee Junction	Oval Patch	U Patch
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17
Time	14:30	14:31	14:36	14:38	13:24	14:35
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R7	R8	R9	R10	R11	R12
Location	P9/1B	1B/1B/P9	P9/1B	1B/P9/P5	P8/1B/1B	P8
Date	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17
Time	13:29	14:12	14:12	14:14	14:20	14:26
Calibrating Number	CE 1	CE 1	CE 1	CE 1	CE 1	CE 1
Dimensions (m)	.3 X .7	.5 X .3	0.3	.5 X .5	1.5 X .5	.5 X .5
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	Tee Junction	Line Extrusion	Tee Junction	Tee Junction	Oval Patch
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17
Time	14:38	14:39	14:40	14:41	14:43	14:45
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	R13	R14	R15	R16	R17	R18
Location	P8/P7/1B	1B/1B/P7	P6/P7/1B	1B/1B/P6	P5/P6/1B	1B/1B/P5
Date	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17
Time	14:30	14:35	14:40	14:47	14:51	14:56
Calibrating Number	CE 1	CE 1	CE 1	CE 1	CE 1	CE 1
Dimensions (m)	.75 X .5	1.5 X .5	1 X .5	.5 X .5	.5 X .5	.5 X .5
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Tee Junction	Tee Junction	Tee Junction	Tee Junction	Tee Junction	Tee Junction
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17	2-Oct-17
Time	14:47	14:49	14:57	14:59	15:01	15:06
Results	OK	OK	OK	OK	OK	OK

Notes:

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# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R19	R20	R21	R22	R23	R24
Location	1B	P4/1B	1B/P3/P4	1B/1B/P3	P2/P3/1B	1B/1B/P2
Date	2-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17
Time	15:06	11:30	11:35	11:40	11:47	12:00
Calibrating Number	CE 1	CE 2	CE 2	CE 2	CE 2	CE 2
Dimensions (m)	.5 X .5	.5 X .5	.5 X 1	.5 X .5	1.5 X .5	.5 X .5
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	Oval Patch	Tee Junction	Tee Junction	Tee Junction	Tee Junction
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	2-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17
Time	15:08	13:20	13:22	13:24	13:29	13:30
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	R25	R26	R27	R28	R29	R30
Location	1B/P1/P2	1B/1B/P1	P1/1B	P1/1B	P1/1B	P1/1B
Date	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17
Time	13:00	13:05	13:13	13:15	13:20	13:25
Calibrating Number	CE 2	CE 2	CE 2	CE 2	CE 2	CE 2
Dimensions (m)	.75 X .5	.75 X .5	.75 X .5	3.0	1 X .5	2 X .75
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Tee Junction	Tee Junction	Oval Patch	Line Extrusion	Oval Patch	Oval Patch
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17
Time	13:31	13:32	13:32	13:34	13:35	13:38
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R31	R32	R33	R34	R35	R36
Location	P1/1B	P2/P3	P3/P4	P3/P4	P3/P4	P3/P4
Date	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17
Time	13:30	13:42	13:51	13:59	14:04	14:10
Calibrating Number	CE 2	CE 2	CE 2	CE 2	CE 2	CE 2
Dimensions (m)	1.0	1.0	1.0	1.0	0.8	0.8
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	U Patch	U Patch	U Patch	Line Extrusion	Line Extrusion	Line Extrusion
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17	3-Oct-17
Time	13:46	13:49	14:07	14:09	14:11	14:17
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R37	R38	R39	R40	R41	R42
Location	P11	P11	P11	P11	P11	P5/P12
Date	17-Oct-17	17-Oct-17	17-Oct-17	17-Oct-17	17-Oct-17	1-Nov-17
Time	13:56	13:56	13:56	13:56	13:56	15:36
Calibrating Number	CE 3	CE 3	CE 3	CE 3	CE 3	CE 4
Dimensions (m)	0.1	0.1	0.1	0.1	0.1	1 X .5
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Bead	Bead	Bead	Bead	Bead	U Patch
Non-destructive Tests	-	-	-	-	-	VBOX
Date	-	-	-	-	-	10-Nov-17
Time	-	-	-	-	-	13:20
Results	-	-	-	-	-	OK

**Notes:** R37 - R40: Beads were placed on small wrinkled area of the membrane to reinforce the area. (No holes in the membrane) The wrinkles were caused by high winds the blew the membrane over. No testing was done since the repair was over a wrinkled spot with no holes. Start Time: 1 :45 PM, Finish Time: 2:00 PM, Air temp: 15°C



# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R43	R44	R45	R46	R47	R48
Location	P5/P12	P5/P12/1B	1B/P12	1B/1B/P12	P12/ P13/1B	1B/1B/P13/P14
Date	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17
Time	15:50	16:10	16:16	15:55	16:00	16:05
Calibrating Number	CE 4	CE 4	CE 4	CE 4	CE 4	CE 4
Dimensions (m)	.75 X .4	.3 X .3	.3 X .5	.2 X .4	.5 X .3	2 X .3
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	Oval Patch	Oval Patch	Tee Junction	Tee Junction	Double Tee Junction
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17
Time	13:20	13:25	13:26	13:40	13:40	13:45
Results	OK	OK	OK	OK	OK	OK

Notes:

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# Repairs

Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL



Weld Number	R49	R50	R51	R52	R53	R54
Location	1B/1B/P14/P15	1B/1B/P16/P15	P15/P16	P16/1B	P5/P12	P5/P12
Date	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	9-Nov-17	9-Nov-17
Time	16:26	16:30	16:51	16:41	13:45	14:15
Calibrating Number	CE 4	CE 4	CE 4	CE 4	CE 5	CE 5
Dimensions (m)	1.5 X .3	1.25 X .3	4.0	.5 X 3	25.0	.3 X .3
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Double Tee Junction	Double Tee Junction	Line	Oval Patch with Line	Line	Oval Patch
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17
Time	13:45	13:46	13:50	15:55	13:20	13:20
Results	OK	OK	OK	OK	OK	OK

Notes:

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# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R55	R56	R57	R58	R59	R60
Location	P5/P12	P14/P15	P15/P16	P16/P17	P15/P16	P16/P17
Date	9-Nov-17	9-Nov-17	9-Nov-17	9-Nov-17	10-Nov-17	10-Nov-17
Time	14:25	14:55	15:01	15:09	14:52	15:00
Calibrating Number	CE 5	CE 5	CE 5	CE 5	CE 7	CE 7
Dimensions (m)	.5 X .3	1 X .5	.5 X .5	.75 X 1	.75 X .5	1 X .5
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	Oval Patch	Oval Patch	U Patch	Oval Patch	Oval Patch
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17
Time	13:20	13:45	13:50	13:55	15:50	15:55
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R61	R62	R63	R64	R65	R66
Location	P21/P20/P18	P21/P20/P19	P18/P19/P20	P22/P23	P23/P24	P23/P24
Date	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17
Time	14:15	14:20	14:30	14:40	14:50	15:02
Calibrating Number	CE 6	CE 6	CE 6	CE 6	CE 6	CE 6
Dimensions (m)	.75 X .5	.75 X .5	.75 X .5	.5 X .5	2 X .5	1.5 X .75
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	Oval Patch	Oval Patch	Oval Patch	Oval Patch	U Patch
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17
Time	16:05	16:07	16:11	16:23	16:25	15:05
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R67	R68	R69	R70	R71	R72
Location	P17/P18/1B	P21/P18/1B	P21/P19/1B	1B/P19	P24/P25	P29/P30
Date	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17
Time	15:25	15:34	15:40	15:43	15:15	15:30
Calibrating Number	CE 7	CE 7	CE 7	CE 7	CE 6	CE 6
Dimensions (m)	.75 X .5	1 X .5	.5 X .3	.5 X .3	1 X 1	2 X 1
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	Oval Patch	Oval Patch	Oval Patch	Oval Patch	Oval Patch / U Patch
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17
Time	16:01	16:03	16:16	16:16	16:27	15:00
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R73	R74	R75	R76	R77	R78
Location	1B/P19/P22	P16	P16	P16	P16	Phase 2/P22
Date	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17	10-Nov-17
Time	15:51	15:27	15:27	15:27	15:27	16:00
Calibrating Number	CE 7	CE 7	CE 7	CE 7	CE 7	CE 7
Dimensions (m)	1 X .75	0.2	0.2	0.2	0.4	2 X .5
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	Bead	Bead	Bead	Bead	Oval Patch
Non-destructive Tests	VBOX	-	-	-	-	VBOX
Date	10-Nov-17	-	-	-	-	10-Nov-17
Time	16:17	-	-	-	-	16:11
Results	OK	-	-	-	-	OK

**Notes:** R74 - R77: Beads were placed on small wrinkled area of the membrane to reinforce the area. (No holes in the membrane)  
 The wrinkles were caused by high winds the blew the membrane over. No testing was done since the repair was over a wrinkled spot with no holes

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R79	R80	R81	R82	R83	R84
Location	2/P22/P23	2/P23	P23/P24/2	P24/P25/2	2/P25	2/P26/P25
Date	10-Nov-17	10-Nov-17	10-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17
Time	16:05	16:20	16:19	8:25	8:45	8:47
Calibrating Number	CE 7	CE 7	CE 7	CE 8	CE 8	CE 8
Dimensions (m)	.5 X .3	1 X .3	1 X .3	3 X 1	.3 X .5	.5 X .5
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	Oval Patch	Oval Patch	3 X Oval Patch, 2 X Line	Oval Patch	Oval Patch
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	10-Nov-17	10-Nov-17	10-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17
Time	16:01	16:29	16:25	9:04	9:04	9:07
Results	OK	OK	OK	OK	OK	OK

Notes:

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# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R85	R86	R87	R88	R89	R90
Location	P27/P26/2	P27/P28/2	P28/P29/2	P29/2	P29/P30/2	P30/P31/2
Date	14-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17
Time	9:07	9:30	9:45	9:50	10:04	10:11
Calibrating Number	CE 8	CE 8	CE 8	CE 8	CE 8	CE 8
Dimensions (m)	.4 X .4	1 X .5	1 X 1	.75 X .3	.75 X .5	1 X 1
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	Oval Patch	2 X Oval Patch	Oval Patch	Oval Patch	Oval Patch
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	14-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17
Time	9:15	9:45	9:55	10:05	10:10	10:52
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R91	R92	R93	R94	R95	R96
Location	P31/2	P31/2	P31/P32/2	P32/P33/2	P33/P34/2	P11/P35
Date	14-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17	24-Nov-17
Time	11:30	11:35	11:48	11:55	11:20	9:00
Calibrating Number	CE 8	CE 8	CE 8	CE 8	CE 8	CE 9
Dimensions (m)	.3 X .3	.75 X .5	1.5 X 1	2 X .5	.5 X .3	1 X 3
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	Oval Patch	Oval Patch	Oval Patch	Oval Patch	U Patch
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	14-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17	25-Nov-17
Time	11:57	11:57	11:58	12:01	12:08	PM
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R97	R98	R99	R100	R101	R102
Location	P11/P35	P11/P35	P11/P35	P36/P35	P37/P36	P37/P38
Date	24-Nov-17	24-Nov-17	24-Nov-17	24-Nov-17	24-Nov-17	24-Nov-17
Time	9:27	9:33	9:47	10:00	10:25	10:35
Calibrating Number	CE 9	CE 9	CE 9	CE 9	CE 9	CE 9
Dimensions (m)	.5 X .5	.5 X .5	1 X .75	1.5	.5 X 1	1.0
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	Oval Patch	Oval Patch	Line	U Patch	Line
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	25-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17
Time	PM	PM	PM	PM	PM	PM
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R103	R104	R105	R106	R107	R108
Location	P38/P39	P41/P40	P41/P40	P44/P41	P44/P41/P45	P41/P42/P45
Date	24-Nov-17	24-Nov-17	24-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17
Time	11:08	16:20	16:30	10:55	11:34	11:11
Calibrating Number	CE 9	CE 11	CE 11	CE 12	CE 12	CE 12
Dimensions (m)	4 / .5 X .5	.3 X .3	.5 X .5	.75 X .5	2 X .3	.75 X .5
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Line/Oval Patch	Oval Patch	Oval Patch	Oval Patch	Tee Junction	Oval Patch
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	25-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17
Time	PM	13:40	13:45	14:15	14:15	14:15
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R109	R110	R111	R112	R113	R114
Location	P48/P42/P45	P45/P46/P49	P48/P49/P45	P49/P50/P46	P45/P46	P45/P48
Date	25-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17	25-Nov-17
Time	11:35	13:30	13:44	14:27	15:00	15:11
Calibrating Number	CE 12	CE 12	CE 12	CE 12	CE 12	CE 12
Dimensions (m)	1 X .75	.75 X .75	1.5 X .5	1 X 1	1.5 X .5	1.5 X .5
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	Oval Patch	Tee Junction	Oval Patch	Oval Patch	Oval Patch
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
Date	25-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17
Time	14:20	11:47	11:48	11:43	11:46	11:49
Results	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

<b>Weld Number</b>	R115	R116	R117	R118	R119	R120
<b>Location</b>	P38/P39	P37/P38	P40/P39	P41/P40	P42/P41	P48/P42
<b>Date</b>	25-Nov-17	25-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17
<b>Time</b>	16:00	15:50	9:19	9:30	9:37	9:45
<b>Calibrating Number</b>	CE 12	CE 12	CE 13	CE 13	CE 13	CE 13
<b>Dimensions (m)</b>	1.5 X .5	2.5	4 X 1	2	1	1
<b>Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)</b>	Oval Patch	Line	Line/Oval Patch	Line	Line	Line
<b>Non-destructive Tests</b>	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
<b>Date</b>	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17
<b>Time</b>	11:50	11:52	11:20	11:22	11:26	11:27
<b>Results</b>	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

<b>Weld Number</b>	R121	R122	R123	R124	R125	R126
<b>Location</b>	P48/P49	P49/P50	P46/P47	P45/P46	P44/P45	P43/P44
<b>Date</b>	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17
<b>Time</b>	9:56	10:04	10:15	10:24	10:51	10:30
<b>Calibrating Number</b>	CE 13	CE 13	CE 13	CE 13	CE 13	CE 13
<b>Dimensions (m)</b>	1	1	1 X 1	1.5	1.5	1.5
<b>Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)</b>	Line	Line	U Patch	Line	Line	Line
<b>Non-destructive Tests</b>	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
<b>Date</b>	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17
<b>Time</b>	11:28	11:29	11:31	11:32	11:33	11:34
<b>Results</b>	OK	OK	OK	OK	OK	OK

Notes:

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# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

<b>Weld Number</b>	R127	R128	R129	R130	R131	R132
<b>Location</b>	P4/P43	P44	1B/P4/P43	P37	P36	P11/P35
<b>Date</b>	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17
<b>Time</b>	10:43	13:55	13:22	14:47	15:12	17:07
<b>Calibrating Number</b>	CE 13	CE 13 / CE 14	CE 13 / CE 14	CE 13 / CE 14	CE 13 / CE 14	CE 13 / CE 14
<b>Dimensions (m)</b>	.75 X 1	2 X .5	1.5 X .75	.3 X .3	.3 X .3	.3 X .3
<b>Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)</b>	U Patch	Line/Oval Patch	Oval Patch	Oval Patch	Oval Patch	Oval Patch
<b>Non-destructive Tests</b>	VBOX	VBOX	VBOX	VBOX	VBOX	VBOX
<b>Date</b>	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17	27-Nov-17
<b>Time</b>	11:35	16:00	16:01	16:02	16:04	17:35
<b>Results</b>	OK	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Repairs



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Weld Number	R133	R134	R135	R136	R137
Location	P11/1B	P34/P51	Phase 2/P34/P51	Phase 2/P52/P51	Phase 2/Phase 2/P52/P53
Date	27-Nov-17	30-Nov-17	30-Nov-17	30-Nov-17	30-Nov-17
Time	17:20	11:11	11:06	10:59	10:56
Calibrating Number	CE 13 / CE 14	CE 15	CE 15	CE 15	CE 15
Dimensions (m)	.3 X .3	1 X 2	2 X .5	.5 X .3	1 X .3
Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)	Oval Patch	U Patch	Oval Patch	Tee Junction	2 X Tee Junction
Non-destructive Tests	VBOX	VBOX	VBOX	VBOX	VBOX
Date	27-Nov-17	30-Nov-17	30-Nov-17	30-Nov-17	30-Nov-17
Time	17:36	AM	11:10	11:05	11:04
Results	OK	OK	OK	OK	OK

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



# Repairs

Project: Phase 8A  
Client: Terrapure  
Prepared By: Environmental  
PL



<b>Weld Number</b>	<b>R138</b>	<b>R139</b>
<b>Location</b>	<b>P52/P53</b>	<b>P51/P52</b>
<b>Date</b>	<b>30-Nov-17</b>	<b>30-Nov-17</b>
<b>Time</b>	<b>10:55</b>	<b>11:21</b>
<b>Calibrating Number</b>	<b>CE 15</b>	<b>CE 15</b>
<b>Dimensions (m)</b>	<b>1.0</b>	<b>3.0</b>
<b>Description (Tee Junction/ Oval Patch/ U patch/ Line extrusion)</b>	<b>Line</b>	<b>Line</b>
<b>Non-destructive Tests</b>	<b>VBOX</b>	<b>VBOX</b>
<b>Date</b>	<b>30-Nov-17</b>	<b>30-Nov-17</b>
<b>Time</b>	<b>AM</b>	<b>AM</b>
<b>Results</b>	<b>OK</b>	<b>OK</b>

Notes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# Verification of Destructive Tests of Welds



Project: Phase 8A  
 Client: Terrapure  
 Environmental  
 Prepared By: PL

Test Number	DS1	DS2	DS3	DS4	DS5	DS6	DS7
Date	02-Oct-17	03-Oct-17	09-Nov-17	10-Nov-17	10-Nov-17	25-Nov-17	25-Nov-17
Time	12:40	1:17	9:51	13:10	13:37	15:10	15:11
Weld Number	S9	S2	S16	S26	S34	S48	S56
Location	P10/P11	P2/P3	P14/P15	P23/P24	P31/P32	P45/P46	P48/P45
Air Temperature (°C)	16	17	5	-6	-5	9	9
<b>PEEL SPECIFICATIONS</b>							
80 mil - 22 kN/m (Hot Wedge Seam) - 126 lbs/in (Hot Wedge Seam)							
Peel Resistance (lbs/in)	141/149	131/127	161/158	175/186	166/150	185/180	190/167
	133/139	131/131	165/157	198/197	180/162	180/179	156/164
	129/134	143/126	163/149	212/172	170/164	164/175	151/181
	132/136	135/122	158/177	147/193	171/148	177/160	158/157
	132/133	121/142	169/151	176/164	169/190	158/163	200/163
Type of Rupture	SE3	SE3	SE3	SE3	SE3	SE3	SE3
<b>SHEAR SPECIFICATIONS</b>							
80 mil - 28 kN/m - 160 lbs/in							
Shear Resistance (lbs/in)	172	182	258	275	274	271	270
	161	185	259	294	291	280	276
	174	183	257	298	288	278	268
	171	177	254	288	305	275	282
	183	179	263	295	271	282	278
Type of Rupture	SE1	SE1	SE1	SE1	SE1	SE1	SE1

Notes: All test coupons are smooth 80 mil on smooth 80 mill

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# Verification of Destructive Tests of Welds



**Project:** Phase 8A  
**Client:** Terrapure  
 Environmental  
**Prepared By:** PL

Test Number	DS8	DS9
Date	25-Nov-17	30-Nov-17
Time	16:00	9:48
Weld Number	S42	S61
Location	P39/P38	P52/P53
Air Temperature (°C)	9	1
<b>PEEL SPECIFICATIONS</b>		
80 mil		
- 22 kN/m (Hot Wedge Seam)		
- 126 lbs/in (Hot Wedge Seam)		
Peel Resistance (lbs/in)	188/181	179/189
	165/171	192/169
	171/164	161/173
	153/176	190/180
	191/160	185/184
Type of Rupture	SE3	SE3
<b>SHEAR SPECIFICATIONS</b>		
80 mil		
- 28 kN/m		
- 160 lbs/in		
Shear Resistance (lbs/in)	268	270
	278	269
	277	272
	283	270
	277	267
Type of Rupture	SE1	ALL

**Notes:** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Appendix 12

## Installer's Quality Control Manual

## Installation & Quality Control Manual



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## **1.0 Introduction**

This manual addresses the Quality Control Program developed and utilized by Terrafix Environmental Technology, Inc. installation personnel to assure the quality of workmanship and the installation integrity of geomembranes. Terrafix Inc. recognizes that careful and specific documentation of the installation is required to substantiate this Quality Control Program.

## **2.0 Geomembrane Installation**

### **2.1 Subgrade Surface**

**2.1.1** The general and/or earthwork contractor shall be responsible for preparing and maintaining the subgrade in a condition suitable for installation of the liner unless specifically agreed otherwise.

**2.1.2** Surfaces to be lined shall be smooth and free of debris, roots, and angular or sharp rocks larger than three quarter 3/4 inches (9mm) in diameter to a depth of four 4 inches (98mm). All fill shall consist of well-graded material free of organic, trash, clay balls or other damaging matter. No sharp edged stones, stones larger than one 1 inch (24.5mm) in diameter or hard objects shall be allowed within the top four 4 inches (100mm) of the subgrade. The surface shall be compacted in accordance with design specifications but in no event below the minimum required to provide a firm unyielding foundation sufficient to permit the movement of vehicles and welding equipment over the subgrade without causing rutting or other damaging effects. The subgrade shall have no sudden sharp or abrupt changes in grade.

**2.1.3** The General and/or Earthwork Contractor shall protect the subgrade from desiccation, flooding and freezing, protection, if required, may consist of a thin plastic protective cover (or other material as approved by the engineer) installed over the completed subgrade until such time as the placement of geomembrane liner begins.

Subgrades found to have desiccation cracks greater than 1/2 inch/12.3mm in width or depth, or which exhibit swelling, heaving or other similar conditions shall be replaced or reworked by the general and/or earthwork contractor to remove these defects.

**2.1.4** Surface Acceptance: Upon request, Terrafix Inc., will provide the Owner's and Contractor's Representatives with a written acceptance of the surface to be lined. (See Appendix A) This acceptance will be limited to an amount of area that Terrafix Inc. is capable of lining during a particular work shift. Subsequent repairs to the subgrade and the surface shall remain the responsibility of the earthwork contractor.

## **2.2 Crest Anchorage System**

**2.2.1** The general and/or the earthwork contractor to lines and widths shown on the design drawings prior to geomembrane placement shall excavate the anchor trench.

**2.2.2** Anchor trenches excavated in clay soils susceptible to desiccation cracks should be excavated only the distance required for that day's liner placement to minimize the potential of desiccation cracking of the clay soils.

**2.2.3** Corners in the anchor trench shall be slightly rounded where the geomembrane adjoins the trench to minimize sharp bends in the geomembrane.

## **2.3 Preparation for Geomembrane Deployment**

**2.3.1** Panel Layout: Prior to commencement of liner deployment, layout drawings shall be produced to indicate the panel configuration and location of seams for the project.

**2.3.2** Identification: Each panel used for the installation shall be given a numeric or alpha-number identifier consistent with the layout drawing. This identification number shall be related to a manufacturing roll number that identifies the resin type, batch number, and date of manufacture.

## **2.4 Field Panel Placement**

**2.4.1** Location: Terrafix Inc. will attempt to install field panels at the location indicated on the layout drawing. If the panels are deployed in a location other than that indicated on the layout drawings, the revised location shall be noted in the field on an as-built drawing that will be modified at the completion of the project to reflect actual panel locations.

**2.4.2** Weather Conditions: Geomembrane deployment shall not be done during any precipitation, in the presence of excessive moisture (i.e. fog, dew), in an area of standing water, or during high winds.

## **2.5 Method of Deployment**

**2.5.1** The method and equipment used to deploy the panels must not damage the geomembrane or the supporting subgrade surface.



**2.5.2** No personnel working on the geomembrane will smoke, wear shoes that can damage the geomembrane, or engage in actions that could result in damage to the geomembrane.

**2.5.3** Adequate temporary loading and/or anchoring, (i.e. sandbags, tires), which will not damage the geomembrane, will be placed to prevent uplift of the geomembrane by wind.

**2.5.4** The geomembrane will be deployed in a manner to minimize wrinkles.

**2.5.5** Any damage to a panel of geomembrane will be repaired in accordance with paragraph 4.3. Any area of a panel seriously damaged (torn, twisted, or crimped) will be marked, cut out, and removed from the work area with resulting seaming and/or repairs performed in accordance with Paragraph 4.3 of this document.

## **2.6 Field Seaming**

**2.6.1** Layout: In general seams shall be oriented parallel to the slope, i.e., oriented along, not across the slope. Whenever possible, horizontal seams should be located not less than five 5 feet (1.52 m) from the toe of the slope. Each seam made in the field shall be numbered in a manner that is compatible with the panel layout drawing for documentation of seam testing results.

**2.6.2** Personnel: All personnel performing seaming operations shall be trained in the operation of the specific seaming equipment being used and will qualify by successfully welding a test seam as described in Paragraph 2.5.3. The project foreman will provide direct supervision of all personnel seaming to verify proper welding procedures are followed.

**2.6.3** Equipment:

**Fusion Welding:** Fusion Welding consists of placing a heated wedge, mounted on a self propelled vehicular unit, between two (2) overlapped sheets such that the surface of both sheets are heated above the polyethylene's melting point. After being heated by the wedge, the overlapped panels pass through a set of preset pressure wheels that compress the two (2) panels together so that a continuous homogenous fusion weld is formed. The fusion welder is equipped with a temperature readout device that continuously monitors the temperature of the wedge.

**Extrusion Fillet Welding:** Extrusion fillet welding consists of introducing a ribbon of molten resin along the edge of the seam overlap of the two (2) sheets to be welded. The molten polymer causes some of the material of each sheet to be liquefied resulting in a homogeneous bond between the molten weld bead and the surfaces of the sheets. The extrusion welder is equipped with gauges giving the temperature at the nozzle.

**2.6.4** Weather Conditions: Terrafix Inc., relies on the experience of the project Superintendent and the results of test seams to determine seaming restrictions by weather. Many factors, such as ambient temperature, humidity, wind, sunshine, etc., can affect the integrity of field seams and must be taken into account when deciding whether or not seaming should proceed. Test seams, as described in Paragraph 2.5.3. are required prior to daily production seaming to determine if the weather conditions will affect Terrafix Inc.'s, ability to produce quality seams. Additional non-destructive and destructive testing of production seams substantiates the decision made by the Project Superintendent to seam on any given day.

**2.6.2** Seam Preparation:

**2.6.2.1** Fusion Welding: Overlap the panels of Geomembrane approximately six 6 inches (150mm). Clean the seam area prior to seaming to assure the area is clean and free of moisture, dust, dirt, and debris of any kind. No grinding is required for fusion welding.

Adjust the panels so that seams are aligned with the fewest possible number of wrinkles and "fishmouths".

A moveable protective layer may be used, at the discretion of the Terrafix Inc., Project Superintendent, directly below the overlap of geomembrane.

**2.6.2.2** Extrusion Welding: Overlap the panels of Geomembrane a minimum of four 4 inches (98mm). Temporarily bond the panels of Geomembrane to be welded, taking care not to damage the geomembrane.

Clean the seam area prior to seaming to assure the area is clean and free of moisture, dust, dirt and debris of any kind. Grind seam overlap prior to welding within one 1 hour of welding operation in a manner that does not damage the Geomembrane.

Purge the extruder prior to beginning the seam remove all heat-degraded extrudite from the barrel. Keep welding rod clean and minimize contact with the ground.

**2.6.3** Test Seams: Test seams shall be performed at the beginning of each seaming period and at least once each five 5 hours for each seaming apparatus used that day. Test seams shall be made on fragment pieces of the geomembrane liner and under the same conditions as the actual field installation.

**2.6.3.1** Test Seam Length: The test seam shall be at least three 3 feet (0.91m) long and should be made by joining two 2 pieces of geomembrane at least 9 inches (220.5mm) in width.

**2.6.3.2** Sample Procedure: Visually inspect the seam for squeeze out, footprint, pressure, and general appearance.

Two random samples one 1 inch (24.5mm) wide shall be cut from the test seam. The specimens shall then be tested in peel using a field tensiometer and shall not fail in the seam. If a specimen fails the entire procedure shall be repeated.

If any of the second set of specimens fail, the seaming apparatus shall not be accepted and shall not be used for seaming until the deficiencies are corrected and a passing test seam is achieved.

After completion of the test the remaining portion of test seam can be discarded. Documentation of the test seams will be maintained listing seamer identification number, welder's name, temperature control setting and test results.

Passing test results records shall be maintained on Terrafix Inc. [Form 1 \(Pre-weld qualification testing\)](#) as enclosed.

**2.6.3.3** General Seaming Procedures: Seaming shall extend to the outside edge of panels to be placed in the anchor trench. While welding a seam, monitor and maintain the proper overlap. Inspect seam area to assure area is clean and free of moisture, dust, dirt, and debris of any kind. Monitor temperature gauges to assure proper settings are maintained and that the seaming apparatus is operating properly. Align wrinkles at the seam overlap to allow welding through the wrinkle.

Fishmouths or wrinkles at seam overlaps that cannot be welded through shall be cut along the ridge in order to achieve a flat overlap. The cut fishmouth or wrinkle shall be seamed. Any portion where the overlap is inadequate shall be patched with an oval or round patch of the same geomembrane extending a minimum of 6 inches (147mm) beyond the cut in all directions.

All cross/butt seams between two 2 rows of seamed panels shall be welded during the coolest time of the day to allow for contraction of the geomembrane.

All "T" joints shall have the overlap from the wedge welder seam trimmed back to allow an extrusion fillet weld. Then grind two 2 inches (49.5mm) minimum on either side of the wedge welder seam and extrusion weld all of the area prepared by grinding.\

### 3.0 Seam Testing - Geomembranes

Terrafix Inc. installation crews will non-destructively test all field seams over their full-length using air pressure, vacuum or other approved test methods, to verify the continuity and integrity of the seams.

### 3.1 Air Pressure Testing

The welded seam created by Terrafix Inc's., fusion welding process is composed of two distinct welded seams separated by an un-welded channel approximately 3/8 of an inch (9mm) wide. The presence of the un-welded channel between the two welded seams permits Terrafix Inc's., fusion seams to be tested by inflating the sealed channel with air to a predetermined pressure and observing the stability of the pressurized channel over time.

**3.1.1** Equipment for Air Testing: An air pump (manual or motor driven) capable of generating and sustaining a pressure between 25 to 30 psi., a rubber hose with fittings and connections, a sharp hollow needle with a pressure gauge capable of reading and sustaining a pressure between 25 to 30 psi. (or other approved pressure feed device).

**3.1.2** Procedure for Air Testing: Seal both ends of the seam to be tested. Insert needle or other approved pressure feed service into the sealed channel created by the fusion weld.

Inflate the test channel to a pressure between 25 to 30 psi, in accordance with the following schedule, close valve, and observe initial pressure after approximately 2 minutes.

Initial Pressure Schedule\*

Material Thickness (Mil)	Minimum Pressure	Maximum Pressure
<b>40</b>	25	30
<b>60</b>	27	30
<b>80</b>	30	30
<b>100</b>	30	30

\* Initial pressure settings are read after a two minute "relaxing period". The purpose of this "relaxing period" is to permit the air temperature and pressure to stabilize.

Observe and record the air pressure five 5 minutes after "relaxing period" ends and initial pressure setting is used. If loss of pressure setting is used. If loss of pressure exceeds the following or if the pressure does not stabilize, locate faulty area and repair in accordance with Paragraph 4.3.

Maximum Permissible Pressure Differential, After 5 Minutes

Material Thickness (Mil)	Pressure Difference
40	4 psi
60	4 psi
80	4 psi
100	4 psi

At the conclusion of the pressure test the end of the seam opposite the pressure gauge will be cut to ensure that the seam is not blocked. If the seam is blocked then the test will have to be repeated after the blockage is corrected. Remove needle or other approved pressure feed device and seal resulting hole by extrusion welding. Record test results on Terrafix Inc. Form 3 (Seam Recording and Air Testing) as enclosed.

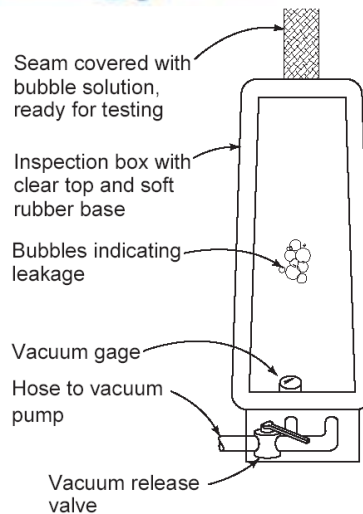
**3.1.3** In the event of a Non-Complying Air Pressure Test: Check seam end seals and retest seams. If non-compliance with specified maximum pressure differential reoccurs, cut a 1 inch (24.5mm) samples from each end of the seam and additional samples at the distance specified in Paragraph 3.4.3.1. Perform destructive peel tests on the samples using the field tensiometer.

If all samples pass destructive testing remove the overlap left by the wedge welder and vacuum test the entire length of seam in accordance with Paragraph 3.3. If a leak is located by the vacuum test, repair by extrusion welding. Test the repair by vacuum testing. If vacuum testing discovers no leak, the seam will be considered complete. If one or more samples fail the peel tests, additional samples will be taken in accordance with Paragraph 3.4.3.

When two 2 passing samples are located, the seam between these two 2 locations will be considered non-complying. The overlap left by the wedge welder will be heat tacked in place along the entire length of seam and the entire length of seam will be extrusion welded. Test the entire length of the repaired seam by vacuum testing in accordance with Paragraph 3.3.

## 3.2 Vacuum Testing

This test is used when the geometry of the weld makes air pressure testing impossible or impractical or when attempting to locate the precise location of a defect believed to exist after air pressure testing.



**3.2.1** Equipment for Vacuum Testing: Vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole or valve assembly and a vacuum gauge. Vacuum pump assembly equipped with a pressure controller and pipe connections, a rubber pressure/vacuum hose with fittings and connections and bucket and means to apply a soapy solution.

**3.2.2** Procedure for Vacuum Testing: Trim excess overlap from seam, if any. Turn on the vacuum pump to reduce the vacuum box to approximately 3 in. of Hg, ie., (3 psi gauge). Apply a generous amount of a solution of strong liquid detergent and water to the area to be tested.

Place the vacuum box over the area to be tested and apply sufficient downward pressure to "seat" the seal strip against the liner. Close the bleed valve and open the vacuum valve. Apply a minimum of 3 in. Hg vacuum to the area as indicated by the gauge on the vacuum box. Ensure that a leak tight seal is created.

For a period of not less than 30 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles. If no bubbles appear after 30 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 in. overlap, and repeat the process.

**3.2.3** Procedure for non-complying test: Mark all areas where soap bubbles appear and repair the marked areas in accordance with Paragraph 4.3. Retest repaired areas.

### **3.3 Destructive Testing**

The procedure of destructive testing is to determine and evaluate seam strength. These tests require direct sampling and thus subsequent patching. Therefore, destructive testing should be held to a minimum to reduce the amount of repairs to the geomembrane.

**3.3.1** Procedure for Destructive Testing: Destructive test samples shall be marked and cut out randomly at a minimum average frequency of one test location every 1000 feet (300m) of seam length. Additional destructive tests may be taken in areas of contamination, offset welds, visible crystallinity or other potential cause of faulty welds. Field test 5 coupons in peel and 5 coupons in shear and at least 4 out of the five 5 coupons must pass the tensile strength properties in both peel and shear. Minimum strength of field seams when tested in shear shall be 90 percent and 60 percent in peel of the unseamed liner.

**3.3.2** Sample Size: The sample should be twelve 12 inches wide (305mm) with a seam 14 inches (356mm) long centered lengthwise in the sample. The sample may be increased in size to accommodate independent laboratory testing by the owner at the owner's request or by specific project specifications.

A one 1 inch (24.5mm) sample shall be cut from each end of the test seam for field testing. The two one 1 inch (24.5mm) samples shall be tested in the field in a tensiometer for peel. If any field sample fails to pass, it will be assumed the sample fails destructive testing. The procedure outlined in Paragraph 3.4.3. shall be followed to locate passing samples to send to the laboratory.

If the sample passes the field test, the remaining portion of the sample test strip can be given to the contractor/owner upon request.

**3.3.3** Procedure in the event of Destructive Test Failure: Cut additional field samples for testing. In the case of a field production seam, the samples must lie a minimum of ten 10 feet (3m) in each direction from the location of the failed sample. Perform a field test for peel strength. If these field samples pass, then laboratory samples can be cut and forwarded to a laboratory for full testing.

If the laboratory samples pass then reconstruct the seam between the two 2 passing sample locations. Heat tack the overlap along the length of the seam to be reconstructed and extrusion weld. Vacuum test the extrusion weld. If either of the samples fail then additional samples are taken in accordance with the above procedure until two 2 passing samples are found to establish the zone in which the seam should be reconstructed.

All passing seams must be bounded by two 2 locations from which samples passing laboratory destructive tests have been taken. In cases of reconstructed seams exceeding

150 feet (45m) a destructive samples must be taken and pass destructive testing from within the zone in which the seam has been reconstructed. All destructive seam samples sent to Terrafix Inc's, office shall be numbered and recorded on Terrafix Inc. [Form 2 \(Destructive Seam Testing\)](#) as enclosed.

**3.4 Quality Assurance Laboratory Testing:** The remaining destructive sample may be sent to a laboratory and will be tested in "Seam Strength" and "Peel Adhesive" [ASTM D6392 with specimen 0.5 inches wide tested at two (2) inches per/minute]. Five (5) specimens shall be tested for each test method with data recorded. Four (4) out of the five (5) specimens must pass and not have more then 10% Film Tear Bond for each test in order for the seam to be considered acceptable.

## **4.0 Defects and Repairs**

**4.1 Concept:** Terrafix Inc. Project Superintendent shall conduct a detailed walk through and visually check all seams and non-seam areas of the geomembrane for defects, holes, blisters, and signs of damage during installation. All other Terrafix Inc., installation personnel shall, at all time, is on the lookout for any damaged area. Damaged area shall be marked and repaired.

## **4.2 Repair Procedures**

Any portion of the geomembrane showing a flaw, or failing a destructive or non-destructive test shall be repaired. Several procedures exist for repair and Terrafix Inc. Project Superintendent shall make the decision as to the appropriate repair procedure.

Procedures available for repair:

**4.2.1 Patching:** Used to repair large holes, tears and destructive sample locations. All patches shall extend at least six (6) inches (147mm) beyond the edges of the defect and all corners of patches shall be rounded.

**4.2.3 Grinding and welding:** Used to repair sections of extruded seams.

**4.2.4 Spot welding or seaming:** Used to repair small tears, pinholes or other minor localized flaws.

**4.2.5 Capping:** Used to repair lengths of failed extruded seams. Removal of a bad seam and replacement with a strip of new material seamed into place.



**4.3** Verification of Repairs: Every repair shall be non-destructively tested using the methods set out in Paragraph 3.4. Repairs that pass the non-destructive test shall be deemed adequate. Large repairs may require destructive test. Repair test results shall be logged on Terrafix Inc. [Form 4 \(Repair Report\)](#) as enclosed.

**Important Note**

**The Terrafix Installation and Quality Control Manual is intended as a guideline only for geomembrane installation. This manual does not supercede the project specific specification.**









**Form 5:** Daily Production Report

terrafix <sup>®</sup> environmental technology inc.		Terrafix Daily Production Report				
<b>Date:</b>		<b>Project:</b>				
<b>Site Day:</b>		<b>Client:</b>				
Manhours						
Employee	Hours	In	Out	Lunch	Travel	Job/Task
<b>Total:</b>						
Production						
Material	m2	Wide	Long	RLS/PNLS	Comments	
<b>Total:</b>						
Notes						
Expenses						
Description	Amount	HST	Total	Notes		
<b>Total:</b>						
Summary						
Man Hours	Total Materials	m2/mhr		Expenses (\$)		

### Appendix B - Notes On Filling in Documents

1. When referencing a location on your paperwork, always use base points that are independent of your paperwork.

Example.

REPAIR #	PANEL #	REPAIR DATE	MACH #	TECH	LOCATION	V.T. TECH	V.T. DATE
1	1/2	6-Jun	X-3#714		15' from anchor on seam	TC	9-Jun
2	2/3	6-Jun	X-3#714		16' from EOS on seam	TC	9-Jun
3	3	6-Jun	X-3#714		36' from DS-1	TC	9-Jun

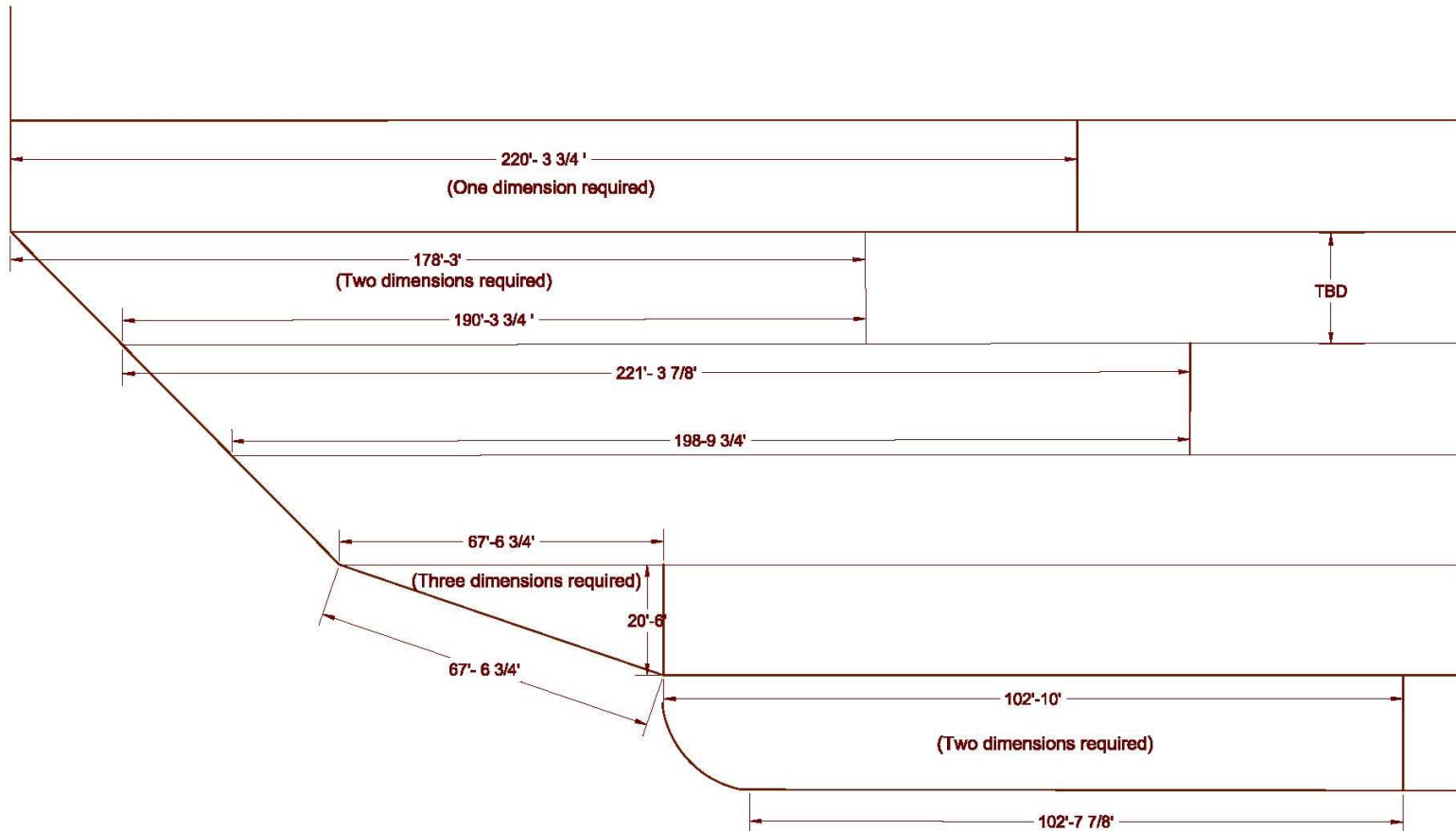
Correct

Not Correct  
(We can't tell where the EOS is without your complete paperwork)

Not Correct  
(We can't tell where DS-1 is without your complete paperwork)

2. When providing panel dimensions in your field book and on the drawing, remember to provide all of the required dimensions and notes. (If there is no room on a single page, start a new one and reference back to the original notes.)





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